ELECTRONICS Australia

INCORPORATING "RADIO, TELEVISION AND HOBBIES"

Volume 28, No. 1 ABC certified circulation in excess of 45,000

Editor:
NEVILLE WILLIAMS, M.I.R.E.E. (Aust.) (VK2XV).

Assistant Editor:
PHILIP WATSON, A.M.I.R.E.E. (Aust.) (VK2ZPW).

Technical Editor:
JAMIESON ROWE, B.Sc. (Tech.), Grad. I.R.E.E. (Aust.).

Technical Staff:
IAN POGSON (VK2AZN).
KEITH WOODWARD (VK2ZAU).
MICHAEL MEECHAN (VK2UF).
ROBERT FLYNN.

Editorial Offices:
12th Floor, 235-243 Jones Street, Broadway, Sydney, Australia. Phone 2-0944, Ext. 2531, 2525-6-7.

Postal Address:
Box 2728, G.P.O., Sydney, Australia.

Advertising:
SELWYN SAYERS, Mgr.
BILL SUMMONS, Rep. Sydney.
CLARRIE LEVY, Rep. Melbourne.
Offices: 8th Floor, 235-243 Jones Street, Broadway, Sydney, Australia. Phone 2-0944, Ext. 2931, 2508, 2943.

Circulation:
W. CUMMINGS, Mgr.
Offices: 9th Floor, 235-243 Jones Street, Broadway, Sydney, Australia. Phone 2-0944, Ext. 2505, 2509.

ubscription Rates:
See back page.

Representation:
Melbourne—John Fairfax & Sons Ltd., 392 Little Collins Street. Phone 67-8131.
Brisbane—Sungravure Pty. Ltd., 78 Elizabeth Street. Phone 2-6688.
Adelaide—John Fairfax & Sons Ltd., 104 Currie Street. Phone 51-3502.
Perth—Sungravure Pty. Ltd., 847 Hay Street. Phone 23-4513.
Newcastle, N.S.W.—Associated Newspapers Ltd., 22 Bolton Street. Phone 2-3696.
London—John Fairfax & Sons (Aust.) Ltd., Reuter Building, 85 Fleet Street.
New York—"The Sydney Morning Herald" Ltd., "Times Annexe," 229 West 43rd Street.

istribution:
Distributed in N.S.W. by Sungravure Pty. Ltd., Morley Avenue, Rosebery, N.S.W.; in Victoria by Sungravure Pty. Ltd., 392 Little Collins Street, Melbourne; in South Australia by Sungravure Pty. Ltd., 104 Currie Street, Adelaide; in Western Australia by Western Press; in Queensland by Gordon and Gotch (A'sia) Ltd.; in New Zealand by Truth (N.Z.) Ltd.; in Tasmania by Davies Bros. Ltd., "Mercury," Hobart.

Driving — and Music

Driving to work the other morning, my attention was caught by a specially interesting item on the radio. A couple of minutes later, my attention returned to the road ahead and I realised acutely that I had driven for a quarter-mile or so, through peak hour traffic, with my mind on anything but cars and pedestrians.

Undoubtedly, most drivers, most of the time, are absorbed in their own thoughts as they travel the roads and it might well be claimed that the mark of a good driver is his or her ability to cope with all traffic situations, irrespective of normal distractions inside and outside the vehicle.

But I wonder how accurate this kind of claim is and how universal its application.

It has often been stated that an emotionally disturbed driver is a menace to himself and to everyone else in the vicinity. A family squabble can make him belligerent toward the driver on his right; a work problem may make him inattentive, so that he drives through a red light or a pedestrian crossing.

But what about the wrong kind of sound from his car radio?

In commercial and industrial situations, many types of radio programs are regarded as highly unsuitable for dissemination over music-while-you-work systems, being variously disturbing, distracting or inappropriate to the particular activity involved. For this reason, organisations have come into being which specialise in disseminating music, carefully selected for its ability to please without intruding.

In a car, the only discipline on what a radio plays—or how loudly—is that exercised by the occupants of the vehicle, with the driver in many cases a minority voice. What effect does it have on his driving efficiency if the program captures too much of his attention, or annoys him beyond words?

During recent years, an enormous amount of research has gone into matters connected with driver efficiency—liquor intake, physical condition, eyesight, hearing, age, emotional state, training, and so on. I cannot recall any mention of the programs which flood into more than half the cars on the road via radio.

A research program may conceivably establish that radio does not adversely affect driver efficiency; well and good. But if indications should be the other way, then at least drivers can be educated to use their radio wisely.

It could even be that the recent trend overseas toward the use in vehicles of pre-recorded tape cassettes might contribute to driver efficiency, by making available music which would please more and intrude less.

Williams

April, 1966

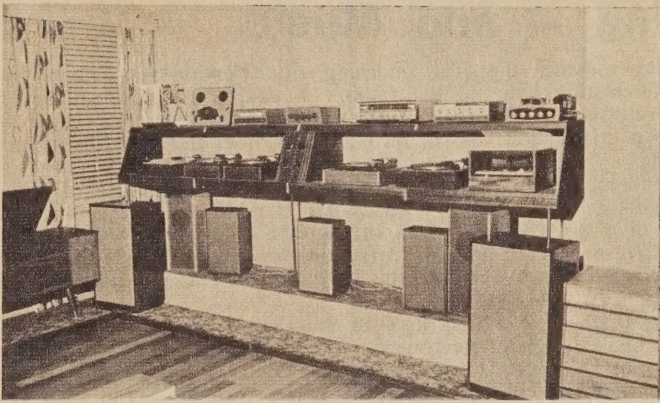
Isotopes in Steel Industry .. 6
Extracting Air from Water . . . 9
Electronic Telephone Exchange 11
Computers and the Humanities 12
Space Communications 17
Review—Heart Telemetry 19
Review—Colour TV Camera .. 21
Scientific and Industrial News 25
3-Band Double-Change Superhet 32
Direct Current Transformer .. 45
The Serviceman 47
DC Supply for Transistors . . . 53
The Answerman 61
Reader-Built-It 67
Forum 69
Reverberation Units 72
Two-band Aerial for Amateurs 74
Twin 5-Watt Stereo Amplifier 80
Pendulum Electric Clock 87
Audio Topics 97
Classical Reviews 104
Documentary Records 109
Variety Fare 113
Trade Reviews 126
Amateur Band News 137
Listening Around the World .. 148
Technical Book/Publications .. 153
Answers to Correspondents 157
Classified Ads. 159
Index to Advertisers 160
Subscription Form 160

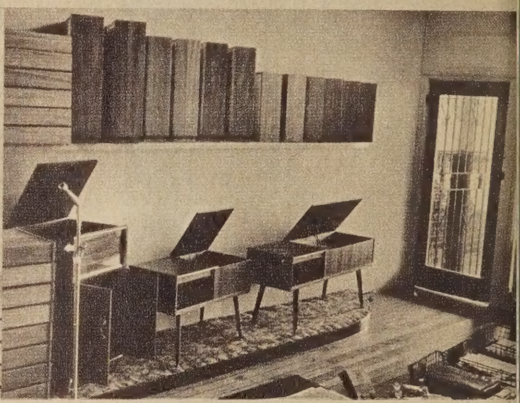
COVER PICTURE

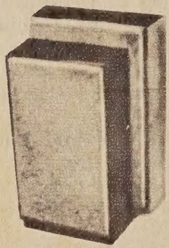
The hamster is in a container completely immersed in water, and cut off from external air supply. It would die of oxygen starvation, but for the fact that the container has "gills" which extract oxygen from the water and pass carbon dioxide and water vapour outside. The gills consist of permeable membranes forming the top and bottom of the container. Scientists envisage the system could have application to submarines and spacecraft. (See story, Page 9.)

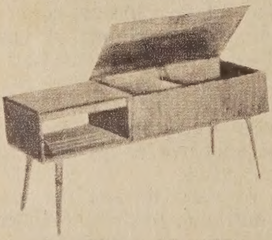
BROADWAY ELECTRONICS

NEW *Audio Sales & Service Centr*









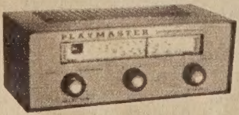
HIGH QUALITY AUDIO EQUIPMENT

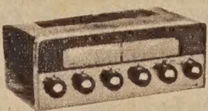
Every requirement of the hi-fi enthusiast is catered for at our new audio showrooms. No. 32 is located only 100 yards off Broadway in Glebe Pt. Road. Parking is O.K. right outside the door and we are open on Saturday mornings. A complete range of Playmaster amplifiers and tuners is available, all precisely to this magazine's specifications. These may be purchased as built and tested units or in kit form to build yourself. (Send coupon for free catalogue). Other well known names in imported amplifiers, tape recorders, etc. are available. We carry big stocks of players, speakers and cartridges, Wharfedale, Goodmans,, Dual, Labcraft, Decca, etc. etc.

You are cordially invited to call, discuss your requirements with us, and to see and hear first class audio gear in operation.

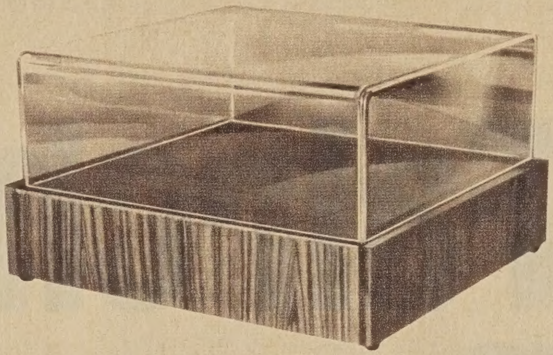
INSTROL HI-FI FURNITURE BUILT and POLISHED or KITS TO BUILD YOURSELF

This is really high quality audio furniture, tailored to suit the equipment of your choice, and most reasonably priced. All designs are available as kits to build yourself at little more than half cost. There are over 20 standard equipment cabinet and enclosure designs. We will gladly quote and supply cabinets or kits to suit your own special ideas. Only highest grade laminated veneered timbers are used. Everything is pre-cut in the kits. No skill is required to assemble and polish from the illustrated instructions included with each kit. No special tools required, only a hammer and screwdriver. The result is a completely professional looking piece of furniture. Send coupon for the free Instrol Cabinet catalogue.





. . . 4 new releases . . .



INSTROL PERSPEX PLAYER COVER

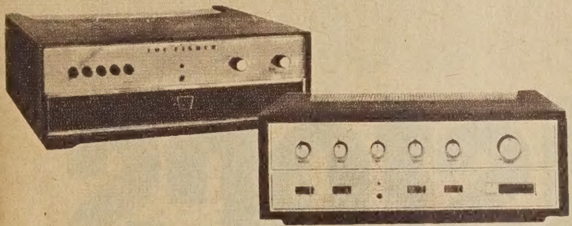
An attractive, one piece, lift off clear plastic cover, complete with stand. The inside measurements of the cover are 15" x 14" x 5" — suitable for most makes of players such as Dual, Labcraft, Garrard, Elac, B.S.R., etc. etc. We will cut the stand to suit your player if you send template with your order.

PRICE: Cover with polished Qld. Maple or .... oiled Walnut stand	$18.00
Cover with oiled Teak stand	$19.25
Perspex Cover only	$9.60
Cutting Stand extra	9.60

(add postage $2)

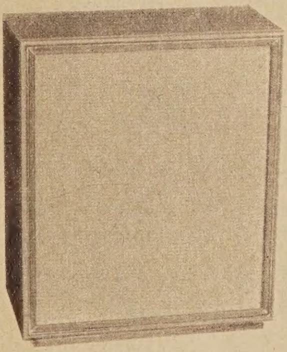
FISHER AMPLIFIERS

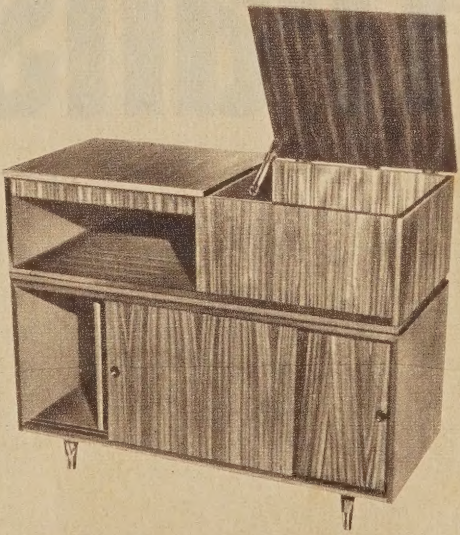
Arriving late February or early March, limited stocks of what is probobly the world's finest and best known amplifier. Two models X100A which is 17 Watts RMS per channel and the 101C of 27 watts RMS per channel. The X100A will sell for $240 and the 101C $296 (both less cabinets). Printed literature available upon request.



TWO NEW INSROL CABINETS

A smart 2 cu.ft. vented enclosure which closely follows the Wharfedale specifications. Made from ¾" laminated timbers, with Innerbond wading it is ideally suited for Godman's, Wharfedale and most makes of 8" and 10" speakers. Also a high quality combination equipment and record storage cabinet. A longer version to incorporate tape recorder is also available. Full specifications in the Instrol Cabinet catalogue.





ROADWAY ELECTRONICS
PTY. LTD.
32 GLEBE ROAD, GLEBE.
SYDNEY. Phone 68-1171.
(only 100 yards off Broadway)

Please send me (mark X against catalogue required).

☐ HI-FI catalogue ☐ INSTROL CABINET Cat.

☐ FISHER leaflet

Name ....

Address ....

Fairchild Power Transistors

FAIRCHILD AUSTRALIA PTY. LTD., 46 CAROLINE STREET, SOUTH YARRA, S.E. 1, VICTORIA / SUBSIDIARY OF FAIRCHILD CAMERA AND INSTRUMENT CORPORATION, U.S.A.

Fairchild features 13 new power transistors, suitable for a variety of needs and applications. High-speed, high-current switching; high-breakdown voltages; operating at up to 10A in saturated condition; power amplifiers. Whatever your power needs, you can select from these silicon Planar epitaxial transistors, available at low cost, ex-stock, for immediate delivery. Write for our data sheets or call for full information. Call 26 6664, South Yarra, or call 43 1537 in Sydney.

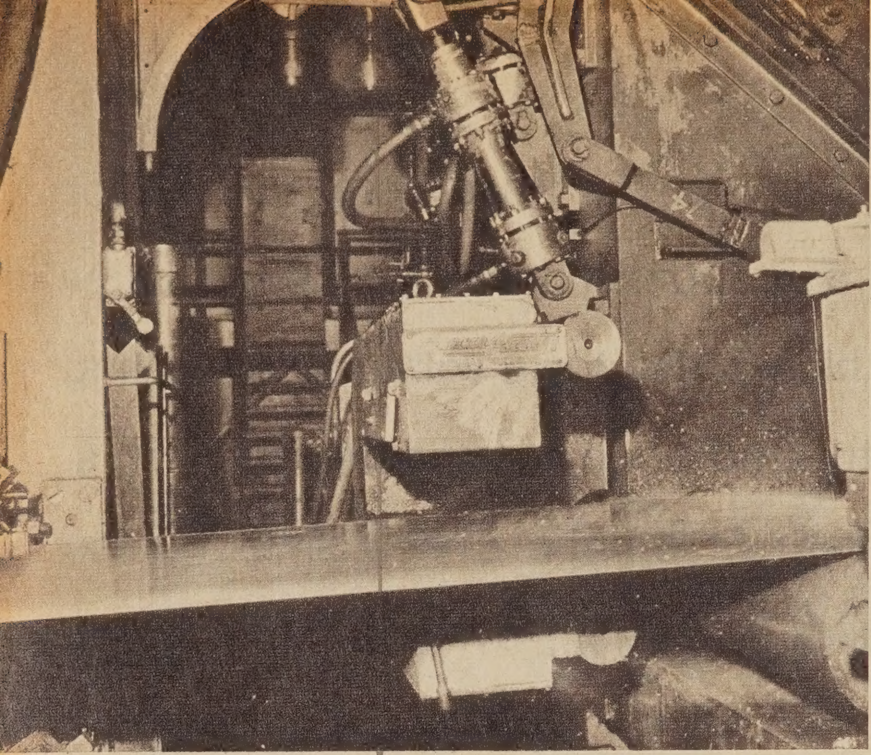
FAIRCHILD
AUSTRALIA PTY. LTD.

NPN Silicon Planar Epitaxial Amplifiers and Switches

Device	Package	V_{CBO}	h_{FE} @ $I_C(A)/V_{CE}(V)$	V_{CES} @ $I_C(A)/I_B(A)$	Power @ (case temp.)	f_T (Typ.)	PRICE* 1-99	PRICE* 100-999
SE3030	TO-3	150	30-260 @ .500/5	1.2 @ 10/1	15W (75°C)	100Mc	A$ 5.40	$ 3.60
SE3031	TO-3	150	30-260 @ .500/5	1.8 @ 10/1	15W (75°C)	100Mc	5.00	3.34
SE3032	TO-3	60	30-260 @ .500/5	1.2 @ 10/1	15W (75°C)	100Mc	5.00	3.34
SE3033	TO-3	60	30-260 @ .500/5	1.8 @ 10/1	15W (75°C)	100Mc	4.50	3.00
SE3035	TO-3	40	30-260 @ .500/5	1.2 @ 1/0.1	15W (75°C)	100Mc	3.60	2.40
2N 3919	TO-3	120	40-120 @ 2/2	1.2 @ 10/1	15W (75°C)	100Mc	5.00	3.34
2N 3920	TO-3	120	100-300 @ 2/2	1.2 @ 10/1	15W (75°C)	100Mc	6.00	4.00
FT 7207A	7/16 hex Isolated case	120	40-120 @ 2/5	.6 @ 2/0.2	30W (100°C)	90Mc	36.00	24.00
FT 7207B	7/16 hex Isolated case	100	40-120 @ 2/5	.6 @ 2/0.2	30W (100°C)	90Mc	32.00	21.00
FT 34A	TO-59	150	40-120 @ 2/2	1.2 @ 10/1	15W (100°C)	100Mc	30.00	20.00
FT 34B	TO-59	120	100-300 @ 2/2	1.2 @ 10/1	15W (100°C)	100Mc	24.00	18.00
FT 34C	TO-5	150	40-120 @ 2/2	1.0 @ 5/0.5	5W (25°C)	100Mc	22.00	15.00
FT 34D	TO-5	120	100-300 @ 2/2	1.0 @ 5/0.5	5W (25°C)	100Mc	20.00	14.00

*PLUS 25% SALES TAX IF APPLICABLE

PLANAR: A Patented Fairchild Process



**By E. BOOTH, B.Sc. (Hons.), London,
Assistant Chief Chemist, Port
Kembla Works, Broken Hill
Proprietary Co. Ltd.,
Australia.**

Gauging the thickness, during production, of cold-rolled steel strip, using a beta-emitting isotope of strontium.

RADIO-ISOTOPES

in the steel industry

The past decade has witnessed an explosive increase in the industrial uses of radio-isotopes and attempts have been made in several countries to assess the economic effects of the introduction of these techniques. Many years ago, in the period 1957-58, the iron and steel industry in the U.K. saved an estimated £262,000 by the use of radio isotopes. It was further estimated that, if the techniques then in use by some companies were uniformly adopted throughout the industry, the potential saving would exceed £1 million per annum.

The characteristics and unique features of these techniques are based on the fact that it is possible to measure very small quantities of radioactive materials and to detect their radiations through the walls of containers, processing plant or other materials. Moreover, for all practical purposes, the disintegration rate (and thus the production of penetrating radiation by the isotope) is independent of temperature, pressure, state of chemical combination or other environmental changes or influences.

Of the particles and rays emitted as a result of the disintegration, the ones which are most useful in industrial applications are beta-particles and gamma-rays. The former are high speed electrons and the latter may be thought of as high energy X-rays and are particularly useful because of their ease of penetration of solid materials.

The most widely applied radio-isotope technique in the steel industry is that of nucleonic thickness gauging. A special feature of these gauges is their ability to measure moving material without contact to provide continuous monitoring of the thickness of, for example, sheet steel. The electrical output from the gauge is suitable for the operation of automatic control equipment where appropriate.

At Port Kembla, N.S.W., one of the most interesting and useful adaptations of this gauging technique is the measurement of the tin coating thickness on tinplate.

In the method currently in use, a beta emitting isotope of hydrogen (tritium) is used to produce X-rays, some of which penetrate the tin coating and base steel and excite X-rays characteristic of the steel. A number of these X-rays re-emerge from the steel, pass through the tin coating and are intercepted by a detector.

The emergent X-rays are attenuated in their passage through the tin in a precisely reproducible manner, dependent on the thickness of the coating. A relationship can thus be established between the strength of the emergent beam and the tin coating thickness. The method is not absolute in the sense that an initial calibration with standards of known thickness is required. At present, the gauge is used in a control laboratory on individual sheets of tinplate, but it is hoped to develop a modified ,though essentially similar, technique for continuous determinations on the strip emerging from the electrolytic tinning line.

Another type of problem, the solution of which is often expedited by the us of radio-isotopes, is that of the dete mination of flow rates, degree of mi ing, or the level of an otherwise inac cessible liquid or solid.

The general method adopted in th first two of these is the injection int the plant stream of a known quantit of an isotope of appropriate chemic form and radiation characteristics. Th time taken for the isotope to becom distributed throughout the stream hom geneously, or to pass from one poi to another, can be determined by appr priate sampling and counting of th radioactivity.

In the determination of levels, th source and detector are so arranged th radiation is intercepted by the materi whose level is to be measured. The r sulting absorption decreases the sign received by the detector and this, i turn, is related to the liquid or soli level.

An application analogous to that the measurement of flow or mixing the determination of weights or volum which would otherwise be difficult time-consuming. An example of this b ing presently studied at Port Kembla the determination of the weight of ste in an open hearth furnace. This info mation is very valuable in terms checks on the furnace yield and enabl additions to be made accurately whic in turn, ensures a product of close controlled composition.

The isotope of choice in this applic tion is usually gold-198. This nucli iixes rapidly in the molten steel, emits gamma-ray of 0.41 MeV (million elec- on volts) which is fairly penetrating nd thus readily detected, and has a alf-life of 65 hours. This means that pproximately every three days the mount of radioactivity is halved, and ı one month will have decayed to one-housandth of its initial strength and ıus be innocuous.

The method is called the "isotope di- ıtion method" and, as its name implies, ıeasures the amount by which a known ctivity of gold-198 is diluted in the urnace. A sample of steel is then taken rom the furnace and cast into a piece f standardised dimensions.

The count of this sample indicates ıe amount of radioactive gold it con- ains. From this, and a knowledge of he original amount added to the fur- ıace, the required weight of steel is eadily calculated.

In the techniques so far described the sotope chosen is one which emits dur- ng its disintegration a penetrating gam- na-ray because the problems associated vith gamma-counting are easier of solu- ion than those of beta-counting.

One of the reasons for this is the ease vith which the beta particles are scatter- d by solid matter and this otherwise lisadvantage is turned to advantage in he technique known as the beta back- catter method. An interesting and use- ul example of this application is in the continuous and non-destructive deter- nination of the ash content of a moving stream of coal.

Although this determination has been uccessfully carried out by an X-ray nethod, the radio-isotope technique seems not to have received the attention t deserves, particularly in view of the considerably lower initial cost, simplified equipment, and equal performance as compared with the X-ray method.

Using a beta source of strontium 90/- yttrium-90, the finely ground and dried coal is moved at a constant speed be- ıeath the source and detector. The beta particles impinging on the coal are scat- ered in a complex manner which can ıevertheless be readily correlated with he mineral, i.e. ash content of the coal. The output signal from the detector is, ıfter amplification, etc., used to display he percentage ash on a chart recorder, hus providing a continuous record of ısh content of the coal sampled a few ninutes previously.

Yet another field in which radio-iso- opes are complementing older tech- ıiques is that of radiography, whereby an X-ray "picture' is taken of a weld, ı casting, or a component to detect flaws and imperfections. The use of gamma- emitting isotopes is complementary to X-ray radiography and each has its part o play, e.g., gamma radiography is slower, cheaper, more portable and more versatile than its X-ray counterpart.

Indeed a 1,000 curie source of cobalt-60 will do the work of a 2 million volt X-ray machine at about the same speed, but when such a large gamma-ray source is appropriately shielded and instrumented for remote control the equipment becomes almost as cumbersome as the X-ray machine and not very much cheaper. In addition, the cobalt-60 is losing strength at the rate of about 1 per cent per month. Smaller sources with activities of a few curies are an attractive proposition in circumstances which do not warrant the investment in expensive X-ray machines.

(A "curie" is defined as the activity of a quantity of any radioactive nuclide in which the number of disintegrations per second is 3.70×10^{10} *(i.e. thirty-seven thousand million). The name is taken from that of Pierre and Marie Curie, who discovered the elements radium and polonium, and were later awarded the Nobel Prize for physics.)*

These gamma-ray sources are particularly useful for radiography in situ in remote locations since their smaller size and weight makes them easier and cheaper to transport and their independence of electrical supplies avoids the necessity for laying supply cables.

Determination in the laboratory of the thickness of tin on tinplate using beta-excited X-ray source

A technique which has had great successes in the determination of traces of impurities in a wide variety of materials, both metallic and non-metallic, is being used in certain sections of the steel industry mainly in a research role, but could possibly in the future find increasing use in a wider sphere. This method is called "radio activation analysis."

It differs fundamentally from the applications already described in that the radio-isotopes studied are not added to the material, but generated within it by irradiation of the sample in the slow neutron flux of a nuclear reactor (although there are now on the market a number of portable neutron generators). In most cases the results of this irradiation are the production of radio-isotopes of the bombarded elements.

If the radioactivity which is induced in one compound of the material can be distinguished or separated from the other radioactivities arising at the same time, or originally present, then the amount of this induced activity is a measure of the parent isotope, and therefore of the parent element present in the original material. The value of this technique is its specificity and extreme sensitivity for certain elements difficult to determine by conventional methods.

Lastly, radio-isotope techniques are playing an ever increasing part in laboratory work. Again, this is mainly of an investigational nature and it may well be that a laboratory equipped to carry out radiochemical and associated work would be desirable as an integral part of the laboratory facilities of every major steel producer.

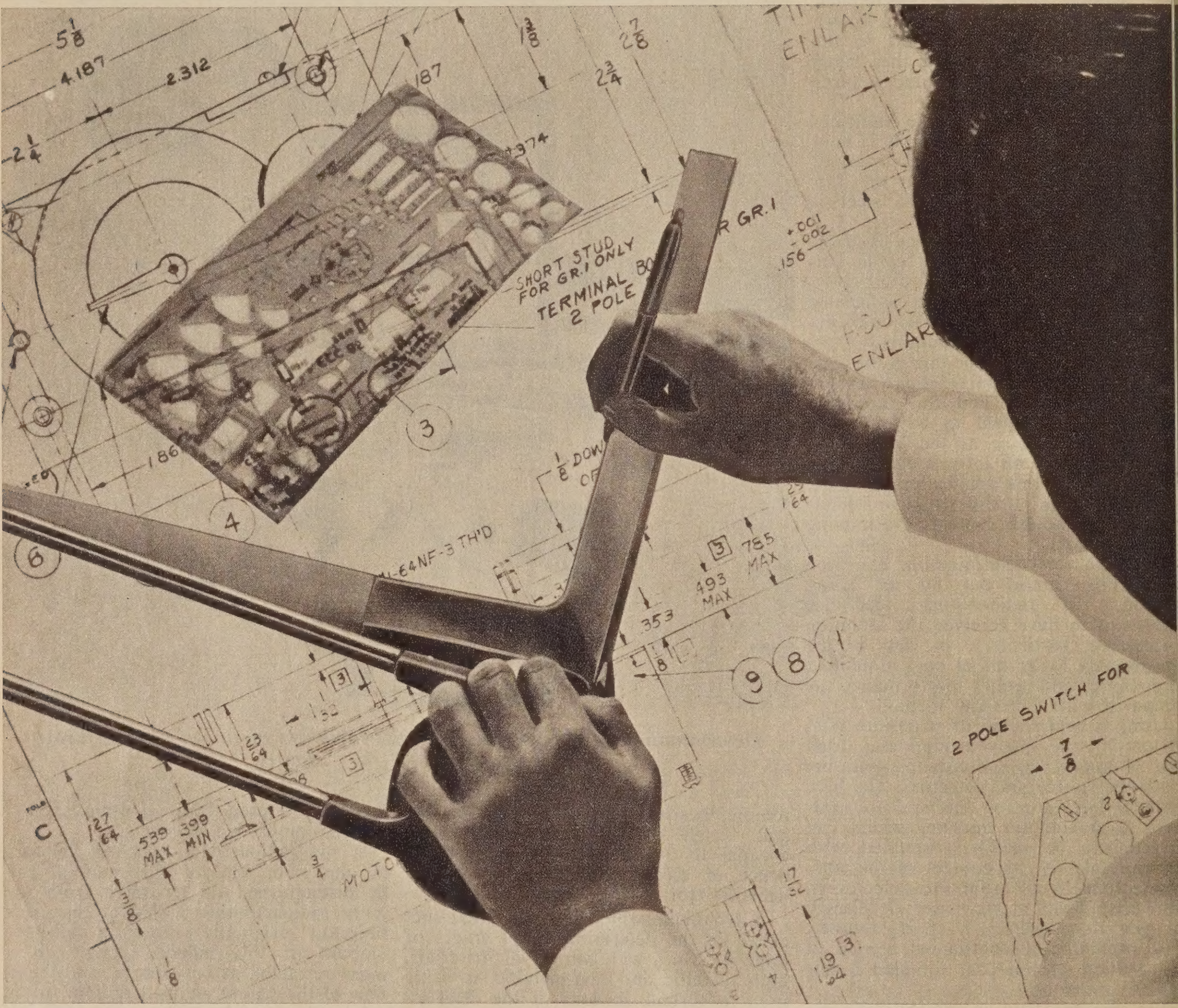
This review of some of the uses to which radio-isotopes can be put in the steel industry makes no claim to be comprehensive or detailed. Indeed, the number and variety of such applications depends mainly now on the ingenuity of the users. It should not be forgotten that the official atomic energy agencies or commissions in most countries are very anxious to help potential industrial users over their initial problems.

(Reproduced by arrangement from "The B.H.P. Review.")

POWER IN SPACE

The United States Atomic Energy Commission has awarded contracts to three American companies to determine the feasibility of a 250/300-watt nuclear isotope for a fuelled power system designed to operate in space for long periods. The companies are Lockheed Missiles and Space Company, General Electric, and Martin. The thermo-electric power system would be designed for very long life in an earth orbit, and six months of studies will be carried out to achieve a lightweight design which will also satisfy safety requirements such as controlled re-entry into the earth's atmosphere.

New SCR is so low-priced, you can use it even in lower-cost automotive and appliance circuits



General Electric C-106 SCR.

This plastic-capsuled flat pack is the world's first really low-cost silicon controlled rectifier. You see it here actual size.

The C-106 SCR is rated up to 200 volts PRV/VBO at 2.0 amps RMS. Four different types of lead configurations are available, for printed circuits or plug-in sockets.

You'll want to consider the C-106 SCR for many applications, such as sewing machines and food mixers; automotive ignitions, warning systems, oil-pressure gauges; nixie and neon drivers; low-speed ring counters and low-power inverters; and for latching-relay replacement.

General Electric manufacturers it by the proved planar-passivated process. All junctions are protected by an impervious silicon-dioxide layer. The plastic encapsulant is resistant to moisture, and it provides mechanical support.

The C-106 SCR is so sensitive that it can be triggered by very small, inexpensive devices. As a result, you can keep down the size of a control package — even incorporate it into the base of an electric food mixer or the handle of a power tool.

Find out how low in cost the C-106 SCR really is. Your General Electric representative has all the details.

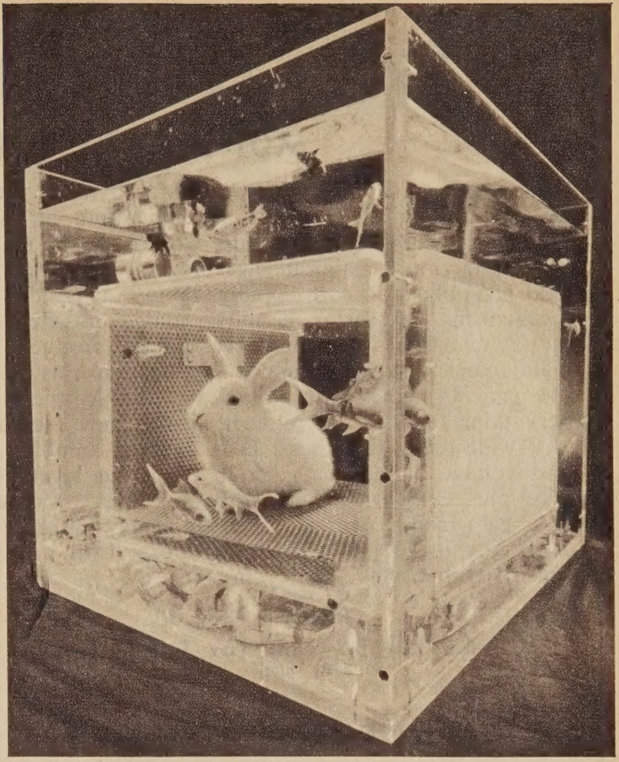
Australian General Electric, 103 *York Street*, *Sydney*, *N.S.W.* 29-7553; 522 *Lonsdale Street*, *Melbourne*, *VIC*. 67-8221.

GENERAL ELECTRIC
Trademark

Cover Picture . . .

SILICONE MEMBRANES EXTRACT AIR FROM WATER

A wisp of synthetic membrane, only a thousandth of an inch thick, may hold the answer to a simple system for supplying submarines with air drawn from the water around them, the purification of air in space capsules or moon stations, and could also be a means of providing cheap, reliable oxygen supplies for patients in hospitals or at home.



Oxygen extracted from the surrounding water is keeping this white rabbit alive in the completely submerged cage.

The secret lies in a silicone film that is thinner, and therefore more permeable, than any silicone membrane ever before reported. Even though this membrane is completely free of holes, it permits the passage of liquids or gases. The method of producing the membrane was discovered by Dr Walter L. Robb, of the General Electric Research and Development Centre. Possible applications are being studied at the company's Advanced Technology Laboratories and elsewhere.

Membranes have been made from a variety of materials. One of the most useful is a special type of silicone rubber, in the development of which General Electric research played a major role during World War II. This membrane is 30 times as permeable as the rubber in automobile tyres would be (at equal thicknesses), and 1,000 times as permeable as the plastic films used for wrapping foods.

Since different gases pass through the membrane at different rates, it is called "selective." The ability of the membrane to "select" those gases which will pass through it most easily could be applied in a space capsule. An opening covered with such a membrane would allow unwanted water vapour and carbon dioxide to escape easily into the vacuum of space, while vital oxygen was held in, because the first two gases pass through much more quickly than oxygen. In fact, since water vapour passes through 60 times as fast as oxygen, the membranes might be used on earth as devices for dehumidifying air.

Oxygen, on the other hand, passes through such a membrane over twice as fast as nitrogen, which makes up 80 per cent of the air we breathe. As a result, if ordinary air is brought into contact with one side of a membrane, while the other side of the membrane is maintained at a lower pressure, the gas passing through the membrane will be rich in oxygen. If the low-pressure side of the membrane is maintained at 1/15 of atmospheric pressure, for example, the air passing through will contain approximately 35 per cent oxygen, instead of the usual 21 per cent. The 35 per cent figure is close to that found in hospital oxygen tents and infant incubators.

A man consumes about three quarters of a cubic foot of oxygen per hour. To meet his requirements solely by means of a selective membrane system could require as little as 2¼ square yards of membrane, plus a compressor or pump to remove the enriched air from the low pressure side of the membrane. The membrane is over 100 times as permeable as the membrane material of which the lungs are composed.

For patients needing oxygen-rich air in hospitals or at home, a small air-enriching device with a compressor to provide a difference in pressure and a membrane to separate the gases could replace pure oxygen bought by the tank, cutting costs sharply. In military field hospitals use of this system would eliminate the need for replacing oxygen cylinders weighing a total of some two to three tons every 10 days. Simplification of the supply problem would be especially important in view of the fact that field hospitals must be capable of being moved and resupplied by air transport. Another medical application of the membrane is in artificial heart-lung machines, necessary during open-heart operations. In this case, the blood would be brought in direct contact with the membrane, while air was circulated on the other side.

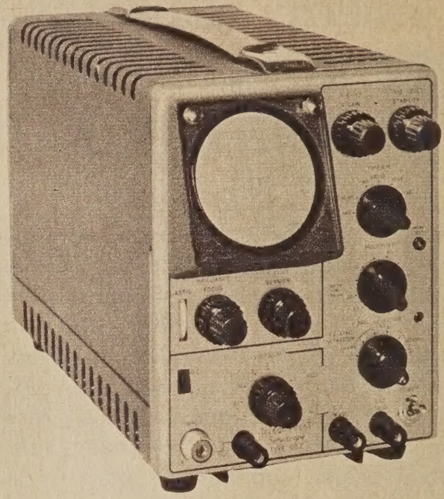
The method of producing the membrane was discovered by General Electrics research scientist Dr. Walter L. Robb, shown here measuring its thickness (1/1000th of an inch) with a micrometer.

In industry, enriched air is used in a variety of processes, where the membrane system could reduce costs. Helium could also be "filtered out" of air or natural gas. In such cases, other types of polymers would be used, rather than silicone rubber, since various polymers differ in the rate at which they allow different gases to pass through.

Underwater applications would depend upon the fact that sea water is essentially saturated with air to a depth of many hundreds of feet. A membrane with sea water flowing past on one side and with pressure below one atmosphere on the other side would extract air, while resisting the passage of water under tremendous pressure. Carbon dioxide and other noxious gases will also pass through the membrane in the reverse direction, into the water. Hence the membrane performs the same function as a gill in a fish. A small quantity of water would pass through, which would be an added bonus, since the salt would be removed from it as it passed through the mem-

TELEQUIPMENT

MODEL S32A SINGLE BEAM SCOPE



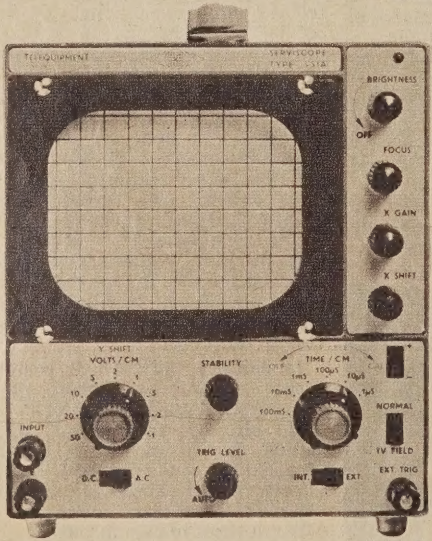
Incorporating a 3" spiral PDA flat-faced tube, specially developed for Telequipment and operating at 3.5KV, the S32A is capable of fast pulse work normally expected only of far more elaborate instruments. This widens the field of application considerably, taking in, besides servo mechanisms, transistor circuits, guided missiles, computers, television and radar development, production and maintenance, such advanced applications as electro-mechanical, medical and biological work. All the familiar Serviscope features are retained in this new oscilloscope . . . wide range time base, D.C. coupled amplifier, time and voltage calibration, unique triggering arrangements . . . plus extra-wide bandwidth of 10Mc/s with a new 10 x gain facility over a limited frequency range. Normal sensitivity is 100mV/cm over 10Mc/s; with x 10 gain, sensitivity becomes 10mV/cm over 1Mc/s.

PRICE: $262.00
plus 12½ per cent Tax F.O.R. Sydney
Slightly higher interstate

CRT 3 in. flat faced single gun PDA operating at 3.5 KV.
Y amplifier: DC to 10Mc/s Max Sensitivity 100mV/cm DC to 1Mc/s. Max Sensitivity 10mV/cm.
Rise Time: 35 nanoseconds.

Accurate calibrated input attenuator Wide Range Calibrated Time Base 18 Pre-set sweep speeds from 1uSec/cm to 0.5Sec/cm; X Expansion to over 10 diameters Triggering: Auto Sync, Selective Built-in TV Sync Separator.

MODEL S51A SINGLE BEAM SCOPE



The S51A effectively bridges the gap between large expensive instruments of extreme accuracy and portable oscilloscopes of such limited performance as to be little more than simple indicators. The S51A adequately meets the demand for an economical unit of good performance. In addition to the S51A itself two other versions of this unit are available:—

S51E (Educational Model): A much simplified unit with the sawtooth voltage brought out to a terminal on the panel marked "SWEEP OUTPUT" at an amplitude of 20V p-p.

S51T: Similar to the S51A but is fitted with a switchable additional horizontal amplifier which increases sensitivity to 100mV/cm with a band width of DC-10Kc/s at —3db.

PRICE: Duty Paid $179.00
S51A Duty Free $226.00
Slightly higher interstate
F.O.R. Sydney Plus Tax

C.R.T.: 5in. Fat-faced PDA operating at 3 KV.
Y Amflifier: DC-3 Mc/s: 100mV/cm.
Attenuator: 100mV to 50V/cm.
Time Base: 6 speeds: 1 uS to 100mS/cm.
Expansion: Continuously variable.
Triggering: Auto-Sync., Selective and TV Sync.
Cooling: Air Thermo-Syphon.

JACOBY, MITCHELL & Co. Pty. Ltd.

469-475 KENT STREET, SYDNEY (26-2651)

MELBOURNE:
15 ABBOTSFORD ST.,
NTH. MELBOURNE.
(30-2491-2)

ADELAIDE:
372A SOUTH ROAD,
GLANDORE. (53-6117)

BRISBANE AGENTS:
T. H. MARTIN P./L.,
WILSON HOUSE,
CHARLOTTE ST.
(2-1785)

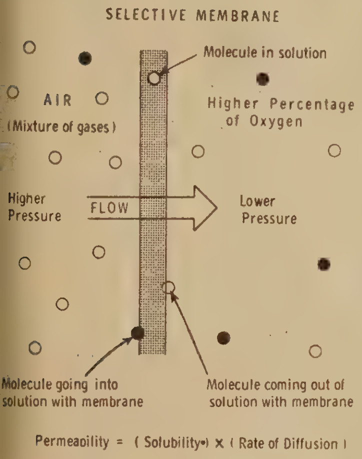
PERTH AGENTS:
C. F. LIDDELOW & CO.,
252 WILLIAM ST.,
PERTH. (28-1102)

TASMANIA AGENTS:
K. W. McCULLOCH P./L.,
P.O. BOX 606G
LAUNCESTON (2-5322)

rane. The crew of a submarine or the nhabitants of an underwater experinental station would therefore be suplied not only with air but also with resh water for drinking. As in the case f other membrane applications, the simlicity of the system should reduce costs nd improve reliability.

In addition to the applications desribed above, General Electric scientists nd engineers foresee the following uses or selective silicon membranes:

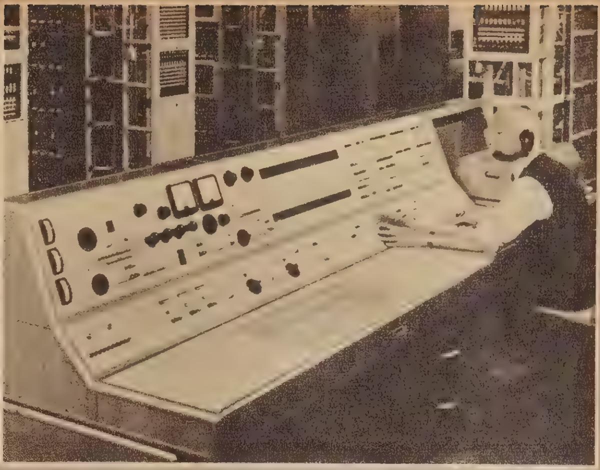
- Home atmosphere control, with air leaned and dried, simply and economially.
- Separation and enrichment of gases or industrial uses. Oxygen-enriched air s used in blast furnaces, for example. uch membranes can also separate elium from natural gas and from air. Other gases, such as nitrogen, hydrogen enon, krypton, and oxides of nitrogen an also be filtered selectively.
- Portable air-regenerating systems. Vorkers in contaminated atmospheres ould wear masks attached to permeable nembrane systems that would clean and ecycle the air for repeated use. In fallout shelters, membrane systems could ikewise provide a supply of purified air.


SELECTIVE MEMBRANE
Molecule in solution
AIR
(Mixture of gases)
Higher Percentage of Oxygen
Higher Pressure
FLOW
Lower Pressure
Molecule going into solution with membrane
Molecule coming out of solution with membrane
Permeability = (Solubility) × (Rate of Diffusion)

The principle used in the silicon membranes is illustrated in this sketch. Although completely free of holes, the membrane can be permeated by molecules of gas, which pass from the high pressure side to the low pressure side.

- Dehumidifying cooling air for elecronic components.
- Human "gills." Man could breathe" underwater like a fish if fitted vith a system of selective membranes.

Dr Guy Suits, General Electric viceresident and director of research, desribing the new membranes at a meeting n New York, referred to them as "a ignificant step forward in man's efforts o control and adapt to his environment. ince man is an air-breathing animal, e faces some difficulties in functioning nder the water, in the vacuum of space, nd even—in some cases—on the usually ospitable surface of the earth. "Some f my colleagues," he added, "have sugested portable air purification systems o be worn on your back when venturing nto some of our more smog-filled cities. think they made the suggestion jokingy. I would hope that we can find some ther solution to that problem." ■



An engineer working on a test console which is designed to test both the subscriber's line and the exchange equipment. It uses keys and rotary switches for selecting all test circuits instead of the normal plugs and cords.

ELECTRONIC TELEPHONE EXCHANGE

To meet the demands of modern telecommunications users, Associated Electrical Industries Ltd., of London, has developed an electronic telephone exchange, as a joint project with British suppliers of telecommunications equipment and the British Post Office.

The increasing demands of modern telecommunications, including the requirement for intercontinental dialling and interconnection of data processing systems, have highlighted the limitations of existing telephone switching techniques and indicated the necessity for high-speed transistor switching compatible with the range and operating speeds of satellite communications. Most of the world's telephone exchanges are still mechanically operated, using electromechanical devices such as motors, springs and levers. The new A.E.I. electronic exchange, known as REX (Reed Electronic Exchange) employs electronically operated reed relays for the switching functions. It has been developed to provide compatibility with existing automatic telephone exchanges.

It can be supplied for new exchanges or as a direct extension of electro-mechanical exchanges, or used for the progressive conversion to electronic operation of telephone exchanges nearing the end of operational service. Among the important technical advances incorporated in the system is an entirely new construction technique which enables equipment for more than 20,000 subscribers to be accommodated in the space normally required for 10,000 circuits in an electromechanical exchange. A REX system can serve an area three times that of a conventional exchange with significant reduction in line plant costs.

The electronic control uses the advanced stored program technique. It is simple in operation, with self-checking and reporting facilities for maintenance purposes.

Existing telephone exchanges throughout the world operate by space-division techniques and use electro – mechanical switches throughout. In the electronic system, these switches are replaced by reed relays. Each relay provides, by virtue of its position in space, a route from a source to a destination. The energisation of a particular coil, to close the reed contacts, is the function of separate control equipment. The reed, being simpler than any other contact, is more reliable; it also offers a better transmission path, requires no routine maintenance, sets up no vibration and is immune from interference by dust and atmospheric pollution. Each reed relay consists of four reed inserts within a single coil. A reed insert consists of two strips of magnetic nickel—iron alloy, the ends of which are gold fused and overlap with a small gap between them. Each insert is hermetically sealed in a glass tube containing a dry gas. A current through the coil causes the two strips of each insert to make contact, and thereby connect the inlet and outlet ends of the relays together. Cross point switches are formed by arranging a number of reed relays in a matrix.

Computers and the Humanities

by Jane A. Shaw

Like their counterparts in the sciences, scholars in the humanities are increasingly using computers for a wide range of research projects.

The venerable amanuensis labouring away in a musty medieval monastery would indeed be amazed at the work methods of his modern counterpart. For scholars in the humanities have in recent years made perhaps the most important discovery in centuries. They have begun to realise the marvels of the electronic computer in its application to research in their fields.

The computer's speed, accuracy, memory, and print ability combined with a new availability to the humanists have opened limitless fields of study in the humanities. Scholarly aids such as concordances, indices, and collations that would have taken several lifetimes to complete are now possible in a remarkably short period of time. Much-needed studies formerly thought impossible are now becoming realities.

In Gallarate, Italy, near Milan, a Jesuit priest, Father Robert Busa, and his staff of 60 aides have, by using a computer, completed a concordance to the writings of St. Thomas Aquinas. An inventory of 15 million words has been put on tape ready to answer in a few minutes questions that would have taken scholars years to answer.

In Budapest, at the Computing Centre of the Hungarian Academy of Science, studies are under way in linguistics, including translation from Russian to Hungarian, semantic distinctions, and morphological and syntactical analyses of word forms.

At Princeton University, the music of Josquin Despres has been coded and stored in the computer for long-term study and analysis.

Cornell University has revived its tradition of concordance making and has published four computer-made poetry concordances since 1959.

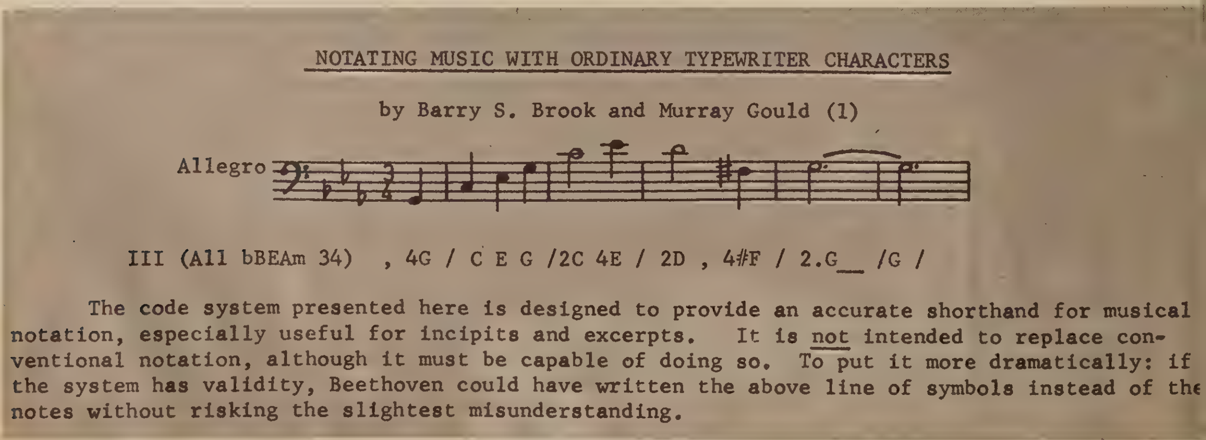
The disputed authorship of the Federalist papers was explored by a statistical study of certain key words, and Frederick Mosteller of Harvard and David Wallace of the University of Chicago, aided by a computer, determined that James Madison was the probable author.

A more recent development was the establishmer this year by New York University of the first Institut for Computer Research in the Humanities. The inst tute's initial program includes projects in literature linguistics, musicology, library indexing, and informatio retrieval. Inter-disciplinary in concept, the institute wi provide an opportunity for scholars working indeper dently or in collaboration but using the same tool—th computer—to meet and discuss their research. It wi encourage scholars and graduate students to undertak research projects, inform them of the varied faciliti available at N.Y.U., and provide a central agency t support current and future research. The new institut at present includes 20 scholars in its membership.

The need for such an institute is apparent cor sidering the comment of the Commission of the Human ties in its recently submitted report to Congress: "A yet we simply do not have enough evidence about th potentiality of various mechanical processes to spea with authority. Some scholars feel that computers wi transform the making of concordances; they have bee used with varying success in problems of textual analysi All these aids and techniques are still new to most of u The main problem is to permit interested humanists t investigate the potentialities of such tools. This mear detailed instruction and study. Only a large-scale pr gram of financial assistance could make such a study a rewarding as it might well prove to be."

Financial support for research in the humaniti has come in increasing amounts from private industr foundations, Government agencies, and from the un versities themselves. Last spring, the American Counc of Learned Societies established a new program c

Portion of a report on a system of music bibliography. Scholars plan to have bibliography information transferred to electronic data processing equipment.



NOTATING MUSIC WITH ORDINARY TYPEWRITER CHARACTERS

by Barry S. Brook and Murray Gould (1)

`III (All bBEAm 34)   , 4G / C E G /2C 4E / 2D , 4#F / 2.G__ /G /`

The code system presented here is designed to provide an accurate shorthand for musical notation, especially useful for incipits and excerpts. It is not intended to replace conventional notation, although it must be capable of doing so. To put it more dramatically: if the system has validity, Beethoven could have written the above line of symbols instead of the notes without risking the slightest misunderstanding.

grants-in-aid and fellowships to encourage scholars to experiment with the use of computers in research in the humanities. Projects already approved range from studies in the structure of atonal music to a study of the text history of Cassiodorus' "Psalm Commentary."

As one scholar has said, "Who would venture to match his powers of measurement and his memory against those of an electronic computer? Study by computer techniques has indeed made obsolete the studies that rely on the memory of the individual, fallible human scholar." The computer, on the other hand, by supplying vast amounts of information, can enhance the individual scholar's judgment and analytical power.

It is this new research tool for the humanist that is gradually closing the much-discussed and written-about gap between the two cultures — the scientist and the humanist. In using computers, the humanist must make clear to the mathematician what he wants to achieve and the mathematician must meet the challenge by devising new methods of using the computer to solve the problems that are unique in the study of humanities.

On the surface, nothing seems less compatible with a computer than Homer's "Iliad," or the poems of Emily Dickinson, the music of Wagner, Mozart or Beethoven; yet a computer has been used in various ways to study all of these and many more.

In 1892, when F. S. Ellis published a concordance to the poems of Shelley, it was the result of six years of work. This January, when "A Concordance to the Poems of Emily Dickinson" was published, editor S. P. Rosenbaum estimated that major machine operations — input, output and corrections — took about a month.

In the preface of the first computer concordance in the Cornell series, S. M. Parris, the editor, recalls the method used by Professor Lane Cooper in 1911 when the first Cornell concordance to the poems of Wordsworth was published. The only method then available was cutting out lines of printed texts and pasting them on 3 x 5-inch slips of paper, each bearing an index word written in the upper left-hand corner. Sixty-seven people worked for seven months on the project that involved 211,000 slips of paper; it was a year before a publisher could be found and another year before it was actually printed.

The computer concordance to Matthew Arnold's poetry took 129 hours to prepare for publication by photo-offset. The step-by-step procedure and breakdown of time have been described by the editor. First, the lines of Arnold's verse were punched on cards, one line per card by key punch operator (69 hours); then line numbers were printed automatically by running through a reproducer the

"I wish it would just give the answers without always adding 'correct me if I'm wrong!'"

"T'was brillig, and the slithy toves Did gyre and gimble in the wabe."

deck of cards representing each poem along with a numbering reference (reference page) on sets of cards. By using the computer, information from 100,000 data cards was sorted and resorted into more than 300 categories. The final copy was printed on the Courant Institute's computer. With the help of the computer, the N.Y.U. project was completed in two years using about 40 machine-hours.

It is only natural that the pioneering efforts in the humanities should have been in literature and in the preparation of concordances and indexes to literature. Further developments in computer methods to meet the needs of humanists have devised ways of automatic abstracting, determining the effect one author has had on another, and of statistical means of establishing author identification, and of built-in proofreading. In musicology, attempts are being made to develop languages and devices applicable to both bibliographical and analytical research. In linguistics, major steps have been made in the area of machine translation and information retrieval.

It is impossible to determine the extent and range of research now under way in the humanities using computers. No such complete survey has been made, and this newly opened area of study is developing at such a rapid rate it is difficult to keep pace with it.

Speaking to the round table of scholars that make up the N.Y.U. Institute, George Winchester Stone, jun., Dean of the Graduate School of Arts and Sciences, emphasised the humanists' responsibility in research and the valuable tool the computer can be.

"The great task of the humanists is to evaluate and interpret the significant. The computer is without parallel as an instrument for organising the masses of material from which the significant may be drawn. And without the basic research for which the computer is a main aid, scholarly criticism and interpretation in many a field reduce themselves to whim and opinion."

Reproduced from 'Electronic Age" by courtesy of RCA.

Computer Research in the Humanities

. . . at New York University

The New York University Institute for Computer Research in the Humanities is an example of the broad spectrum of research in the humanities that is under way or planned with the aid of computers. The Institute's program includes:

A concordance of medieval Hebrew poetry and an annotated catalogue of 25,000 rare Hebrew manuscripts (planning stage): Dr Abraham I. Katsh, professor of Hebrew culture and education and chairman of the department.

A concordance to the poetry of the Spanish poet Eugenio Florit, a pilot project. Concordances are planned for the poetry of Federico Garcia Lorca, Jorge Guillen, and Unamuno; an inquiry into the relationship between the traditional dances of northern Aragon and selected sacramental plays of the seventeenth century by comparing words, phrases, lines, meter, themes, character types: Dr Alice M. Poolin, associate professor of Romance languages, with Dr Maria Soledad Carrasco, associate professor of Romance languages, Hunter College.

An attempt, by using as a pilot project Henry James' "Daisy Miller," to find a speedier, more accurate, and less time-consuming way of constructing collated editions of literary texts (in progress): Dr William M. Gibson, professor of English.

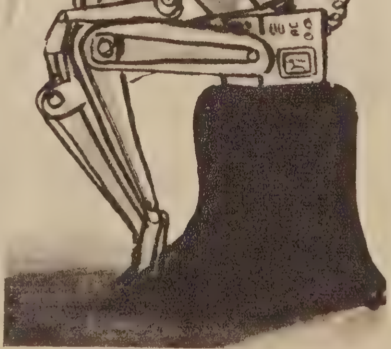
A comparison of the major stylistic patterns in Daniel Defoe's known writings with those anonymous writings with which he is often credited to determine authorship (planning stage): Dr Edward L. McAdam, Jnr., professor of English and chairman of the department at NYU's University College of Arts and Science.

A concordance to include lesser known Latin and Greek authors (in progress): Dr Charles W. Dunmore, assistant professor of classics and acting chairman of the department at NYU's University College of Arts and Science.

A critical edition of the four instalments of Robert Browning's "The Ring and the Book" indicating the changes and revisions made by the poet (planning stage): Dr Edward C. McAleer, professor of English and chairman of the department at Hunter College in collaboration with the department of English at NYU.

An annotated bibliography of significant criticism of and allusion to the life and work of William Godwin (in progress): Dr Burton R. Pollin, associate professor of English at Bronx Community College, in collaboration with the department of English at NYU.

Preparation of a Welsh etymological dictionary and an analysis of consonant clusters and their frequency of occurrence in various languages as well as in various periods of the same language (planning stage): Dr Robert A. Fowkes, professor of German and acting head, all-university department of Germanic languages and literatures.



A study of certain areas of Russian verb morphology, traditionally called "fluid"; a computer analysis of three million words of Russian text (near completion): John E. Allen III, instructor in Russian.

A machine translation project involving linguistic analyses of modern scientific Russian and the creation of a "string grammar" (in progress): Mr Allen.

A Union Catalogue of eighteenth-century symphonic themes of the period from the death of Bach in mid-eighteenth century to the advent of the mature works of Haydn some 30 years later (in progress): Dr Jan LaRue, professor of music.

Application of computer analyses to the pursuit of factors of musical style (in progress): Dr Harold J. Heeremans, professor of music and chairman of the department, University College of Arts and Science.

A technical and stylistic analysis of the contrapuntal music of the period of sixteenth-century composer Orlando Lassus (in progress): Dr Stephen Jay, professor of music.

The study of existing reference and information retrieval systems (e.g., KWIC, WADEX, etc.) with the view to developing the best system for a total bibliography of musical literature (in progress): Dr Barry S. Brook, visiting associate professor of music.

THE NEW CELESTION "DITTON 10"

Regarded as one of the most advanced compact speaker systems ever to be released, the Celestion Ditton 10 is available in either teak or walnut oiled finishes. Frequency response is conservatively quoted at 35-15,000 c/s. See the reviews in "Electronics Australia," p. 131, Dec. 65; "Hi-Fi News," p. 433, Oct. 65; "Gramophone," p. 41, June 65. Size of the Ditton is only 12¾ in x 6¾in x 8¼in. Encel price **$59**

KELLY SPEAKERS

Now a subsidiary of the Decca group, the Kelly organisation has increased production and reduced the back-lag in supply to world markets. The technical know-how and financial resources of the Decca group assure rapid development and ever-increasing supply of Kelly Speakers.

RIBBON TWEETER $39

The Kelly Mk. II Ribbon Tweeter is regarded as the most effective domestic tweeter ever available. Now only $39. Crossover to match .. $11. Encel prices make Kelly units an attractive buy for the enthusiast demanding superior speaker systems.

Mk III Woofer $39

The Mk. III 12" Bass Unit performs very well in small enclosures up to 5 kc. Designed for use with the Kelly Tweeter.

CELESTION "STUDIO SERIES" SPEAKERS

Both Celestion co-axial 12" models are proving very popular in Australia . . . and the price is more than competitive. The Standard Model CX1512 has a conservatively quoted frequency response of 30-15,000 c/s and is rated at 15 watts RMS. The Deluxe Model CX2012 (illustrated) has a frequency response **conservattively** quoted at 30-18,000 c/s and is rated at 20 watts RMS. Both models employ pressure type tweeters and feature an electrical crossover at 4 kc/s. See the reviews in "Electronics Australia," p. 131; Dec. 65, "Gramophone," p. 511, April '65, "Hi-Fi News," p. 75, June '65.

ENCEL PRICES

Standard CX 1512	**$39.50**
Deluxe CX 2012	**$59.00**

Cabinet construction details are available on request.

TOP VALUE STEREO SYSTEM

Linmark SA2000 stereo amplifier, Labcraft 643 turntable with B & O magnetic diamond cartridge, two Wharfedale 8in. RS/DD wide range speakers. **$138**

TAPE RECORDERS

Advertising our tape recorder prices is forbidden; sufficient to say that Encel tape recorder sales are at an all time high. Write for your EMQ. Stock now includes: Revox G36, two and four track; Tandberg 64 and 74B; Beocord 2000 and 1500; Akai M8, X4, 355, 1700; Sony 500a, 200, 357-4, etc; National 703S, 705, 755S; Philips EL3548, EL3549, EL3301, Ferguson; Truvox and many more. **TAPE DECKS.** Write for prices of Collaro, Sony TC250A and Grundig TM45 tape decks.

TURNTABLES NOW IN STOCK

Orpheus, Labcraft, Garrard, P.E., Lenco, Thorens, J.H., Dual, etc.

SPECIAL BUDGET STEREO SYSTEM

Pioneer SMB161 stereo amplifier with AM/AM/SW tuners, Dual 1010 hi-fi turntable, two 8in wide-range speakers $199 (with the Roland FAX150 amplifier) **$185**

WHAT IS AN EMQ!

Many prices cannot be advertised because of trade agreements, so we advise you to write for an EMQ . . . an Encel Mail Quote. When asking for prices on amplifiers and tape recorders please specify features required. Combinations of any components are possible — simply tell us of your requirements. Please supply your FULL ADDRESS in BLOCK LETTERS.

KEF SPEAKERS

The new KEF "Celeste" with the improved "Super-tweeter" is now in stock. HF performance is considerably improved with this new tweeter. Write for an EMQ now on the new model KEF "Celeste."

AMPLIFIERS NOW IN STOCK

Leak, Lux, Encel, Pioneer, Roland, Linmark, etc.

NEW CELESTION TWEETER UNIT

The Celestion HF1300 tweeter is now available in Australia. This unit is a development of the GEC BSC 1852 . . . which needs no introduction to hi-fi enthusiasts. Frequency response is level within plus or minus 2db from 1500 c/s to 13 kc/s and extends well over 15 kc/s. Ratings quoted are conservative. Simply connected via a 10 mfd capacitor. Popularly priced at **$15**

THE LUX SQ11 . . . AUSTRALIA'S MOST POPULAR SOLID STATE STEREO AMPLIFIER

Users everywhere report excellent performance with this fully transistorised stereo amplifier. Input sensitivity is 4mV, output is 20 watts in each channel. Features include: Loudness control, scratch and rumble filters, separate bass and treble controls, etc. Send for full details. Similar quality is usually twice this price. **$139**

SPEEDY MAIL ORDER SERVICE

When ordering be sure to give your full address, printed in BLOCK LETTERS. All equipment is carefully packed to ensure safe delivery. All orders are dispatched promptly.

INTERCOMMUNICATION SYSTEMS

Price conscious buyers will be interested in these new Encel systems. "Eden"-7 station, $35.50; 4 station, $27.50; "Gem"-3 station, $11.50; 2 station, **$9.50.**

CAMERAS AND PROJECTORS

Encel Electronics now carries a fine range of photographic equipment. All equipment is brand new and guaranteed. Ask for an EMQ on the best-known makes of cameras and projectors. Sorry, no phone quotes . . . trade associations do not approve!

NEW IMPROVED ENCEL X1212

The new model X1212 stereo amplifier features in input sens. of 4mV, output of 12 watts in each channel and frequency response of 30-50,000 c/s.
NEW LOW PRICE **$85**

UNIQUE ENCEL STEREO SYSTEM WITH 5 SPEAKER ENCLOSURES

If yiu wish to purchase a complete stereo system at budget rates, this outstanding offer must interest you. Included are the Star SA30 stereo amplifier — 10 watts RMS each channel, Labcraft 643 turntable fitted with B and O stereo diamond magnetic cartridge, two "Encel-ette" 5 speaker systems with oiled walnut or teak cabinets. Each speaker system employs four 6½in speakers and one 2½in tweeter **$190**

(The new model Encel X1212 stereo amplifier may be substituted for the SA30 without additional cost.)

BUY YOUR "STEREO 30" NOW!

Encel trade-in prices on this remarkable LEAK amplifier are at their peak . . . so write now for an EMQ or a trade-in valuation.

TONE ARMS AND CARTRIDGES IN STOCK

Ortofon, ADC, SME, Shure, All Balance, JH, Pritchard, etc.

ACOUSTECH AMPLIFIERS

Without doubt the ACOUSTECH is the finest amplifier in the world — many leading international reviewers use ACOUSTECH in their personal sound systems. The ACOUSTECH III Power amplifier is the world's most advanced solid state unit — and the new ACOUSTECH IV Control Unit has many facilities. For the connoisseur ACOUSTECH amplifiers are the ultimate in design technology and performance. Write for full technical specifications and a EMQ.

DICTATING MACHINES NOW IN STOCK

Philips 3582, Stenorette LWE, Olympia.

EXCLUSIVE ENCEL OFFERS FOR APRIL

1. Mullard 6GW8 4 watts per channel stereo amplifier in case, Labcraft 643 turntable with stereo diamond cartridge, two Wharfedale 8in speakers. An ideal budget system. Price **$110**

2. The high performance Star SA 30 or Encel X1212 stereo amplifier, Labcraft 605 turntable, JH tone arm, ADC 770 stereo diamond magnetic cartridge, two twin-cone 10-inch Wharfedale RS/DD speakers. (Richard Allen or Stentorian speakers may be substituted without additional cost.) Price **$189**

- * With Sony TC250a stereo tapedeck (2 speeds) fitted with recording and playback amplifiers $328
- * With Grundig TM45 3-speed 3-head stereo tape deck, fitted with recording and playback amplifiers as used in the TK46. $365

3. Orpheus Silex transcription turntable, Pritchard tone arm fitted with ADC-10E cartridge. Price **$137**

4. Pioneer SMB161 stereo amplifier with AM/AM/SW tuners, Labcraft 643 turntable fitted with a B. and O. stereo diamond magnetic cartridge, two 8in Wharfedale RS/DD speakers **$185**

(Save $10 by using the Roland FAX150 amp. with a Labcraft 605 turntable, All-Balance tone arm and ADC770 cartridge, $195.)

5. Leak Stereo 30 stereo amplifier, Orpheus Silex turntable, ADC-40 tone arm, ADC-4E cartridge, two Celestion CX2012 co-axial wide range speakers **$438**

6. Lux solid state stereo amplifier, Dual 1009 turntable with ADC 660 E cartridge, two Celestion CX1512 co-axial speakers. Price **$310**

With Garrard Lab 80 and Celestion CX 2012 speakers $365

7. Sansui Model 220 stereophonic amplifier with AM/FM/SW tuners, two KEF Celeste Speaker Systems **$335**

8. Garrard Lab 80 transcription turntable with ADC 660 E elliptical diamond cartridge. Price **$114**

Make up your own combination and ask for an EMQ!

EARLY ENCEL SPECIALS STILL AVAILABLE

The Special offers made from time to time by Encel Electronics in "Electronics Australia" (Page 15) are kept open for several months. In the majority of cases, the prices quoted are still applicable. Please check with us.

Encel Electronics

Head Office:
431 Bridge Road, Richmond, Vic. Tel. 42 3762
City Branch: 18 Bourke Street, Melbourne. Tel. 32 2672

roband
0.853
ZERO
RANGE
VOLTMETER TYPE RDV 32

RDV32

4 DIGITS
.1% ACCURACY
.1% RESOLUTION
1mV MAX. SENSITIVITY

The RDV 32 is a four-digit instrument with adequate facilities for a wide range of industrial uses and is offered at a most competitive price. Simplicity and speed of operation are combined with maximum legibility of the long-life indicators. Print-out signals can be provided.

Light, compact and rugged, the RDV 32 employs solid-state components and easily accessible printed-circuit boards.

Number of digits	4
Range (full scale)	1.099 V to 999.0 V (in 4 ranges)
Maximum resolution	1 mV
Accuracy	0.1% ± 1 digit (0.5% on 1000 V range)
Impedance 1 V range	100 k ohms
10 V range	1 M ohms
100 V range	10 M ohms
1000 V range	100 M ohms
Sampling rate	30 per second
Temperature range	14 °F to 113 °F
Mains supply	100 V to 125 V and 200 V to 250 V, 45 to 60 c/s, 25 VA
Size	12 9/16 in. W × 12 3/4 in. D × 3 9/16 in. H.
Weight	14 3/4 lb.
Price	$768

The RDV 32 can be supplied with a standard 19 in. x 3½ in. front panel (type 19RDV 32) for an additional $16. Decimal or binary-coded decimal readouts can also be provided at an additional cost of $16. But unless these optional items are specifically ordered standard instruments are supplied.

roband
DIGITAL SYSTEMS

RDV42

4 DIGITS
.1% ACCURACY
.01% RESOLUTION
100 μV MAX. SENSITIVITY

The RDV 42 is a four-digit instrument capable of measuring d.c. voltages over a wide dynamic range and is ideally suited to many applications in industry. Voltage readings are displayed on clear, long-life indicator tubes while print-out signals can also be provided. Simplicity and speed of operation combined with Roband reliability are features of this instrument. Light, compact and rugged the RDV 42 is constructed on printed-circuit boards that open like the cover of a book for quick inspection and employ all solid-state components.

Number of digits	4
Range (full scale)	0.9999 V to 999.9 V (in 4 ranges)
Maximum resolution	100 μV
Accuracy	0.1% ± 1 digit (0.5% on 1000 V range)
Impedance 1 V range	100 k ohms
10 V range	1 M ohms
100 V range	10 M ohms
1000 V range	100 M ohms
Sampling rate	30 per second
Temperature range	14 °F to 113 °F
Mains supply	100 V to 125 V and 200 V to 250 V, 45 to 60 c/s, 25 VA
Size	12 9/16 in. W × 12 3/4 in. D × 5 3/4 in. H.
Weight	18 lb.
Price	$1016

The RDV 42 can be supplied with a standard 19 in. x 5¼ in. front panel (type 19RD 42) for an additional $18. Decimal or binary-coded decimal readouts can also be provided at an additional cost of $16, but unless these optional items are specifically ordered, standard instruments are supplied.

All prices are trade F.O.B. Sydney exc. duty and sales tax.

ACCESSORIES

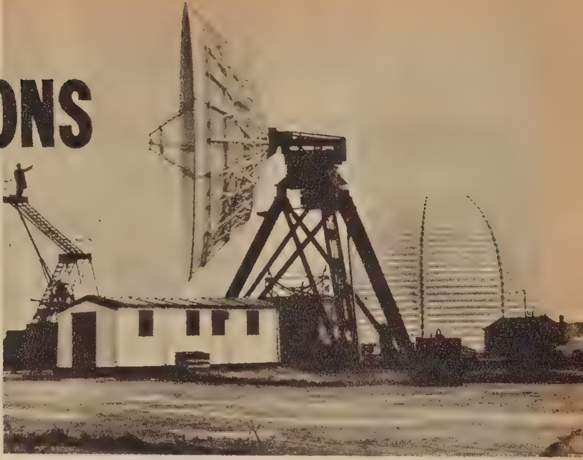
RDC1 Converter for operation from 12 or 24 V d.c.	$132
RDD3 External display module	$132

For further information please phone:

AMALGAMATED WIRELESS (AUSTRALASIA) LIMITED
Engineering Products Division,
SYDNEY 2 0233 MELBOURNE 67 9161 BRISBANE 4 1631
ADELAIDE 51 0111 PERTH 28 3426 LAUNCESTON 2 1804

SPACE COMMUNICATIONS IN BRITAIN . . .

Three space communications stations, which will provide the first British military satellite communications system, are currently being built in Britain by The Marconi Company. The company has reached an advanced stage with manufacture of the equipment, and the first system has already started tests.



One of the 40ft dish aerials designed for the space communications stations, fitted on a temporary mounting for testing purposes. In the background is the 60ft high inflatable radome into which the aerial will eventually be moved, to provide weather protection.

An order from the British Ministry of Aviation covers the design, manufacture, testing and final commissioning of three high-power, self-contained, air-transportable satellite communications ground stations. These stations will take part this year in a joint project with American military authorities, using a series of near-synchronous satellites aunched by the U.S.A.

Each station will employ a 40ft diameter dish aerial, in conjunction with a fully steerable mounting. This whole ssembly will be demountable for air transportation. The transmitting, receivng and station control equipment, inluding power supplies and other supporting services, will be fitted into operaional containers which can be transported as complete units.

This photograph, taken from below one of the 40ft diameter aerials installed inside its radome, shows part of the fully steerable mounting below the supporting framework of the dish.

The stations will also incorporate the Marconi MYRIAD microelectronic computer. This extremely powerful machine will make it possible to synchronise high speed digital data transmission to provide unbroken hand-over from one satellite, passing below the horizon, to another one coming into range. The MYRIAD computer will also be able to control the aerial tracking system and the switching of recording facilities.

Much of the equipment for these stations had to be designed specifically for the project. An important feature of the design of these stations is the requirement that each should be capable of being transported to any part of the world by air. Both the Lockheed C-130 Hercules, and the Short Belfast aircraft would be suitable. The equipment will be broken down into major sub-units which can be rapidly deployed and assembled on site.

. . . AND IN AUSTRALIA

A new communications satellite earth station to be built by September, 1966, at Carnarvon, W.A., will form part of a world-wide system designed to provide communications between tracking and control stations engaged in the NASA Apollo (manned landing on the moon) project, through satellites located over the Atlantic and Pacific Oceans. The new station will be operated by Overseas Telecommunications Commission (Australia).

The Carnarvon station will be one of a chain, other stations being located at Canary Islands, Ascension Island, Andover, Maine (U.S.A.), Brewster Flat, Washington (U.S.A.), Paumalu (Hawaii) and on NASA owned ships in the Indian, Pacific and Atlantic Oceans.

OTC's Carnarvon satellite earth station will provide circuits for voice communication between ground controllers in Australia and the U.S.A., plus teleprinter links and data circuits between these points.

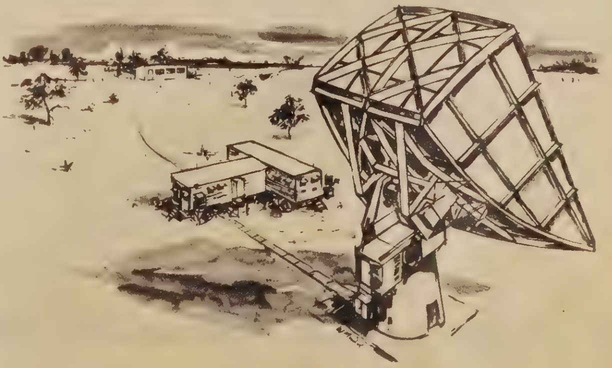
The Carnarvon station will comprise a new type of antenna (illustrated) about 60 feet high, two air-conditioned vans for the associated electronic equipment, and a small operations/control building.

The aerial will be of the type known as a casshorn, with inter-acting parabolic and hyperbolic reflectors which gather microwaves from the satellites over a surface about 42ft square.

Received signals, which are extremely weak, are passed to a special radio receiver designed to minimise its inherent noise level. This receiver operates in an atmosphere of helium refrigerated to a temperature in the vicinity of 420 degrees below zero on the Fahrenheit scale.

The air-conditioned vans will contain computer-type equipment to control the antenna so that it keeps its pencil-thin beam pointed directly toward the satellite under varying conditions of wind and temperature.

Artist's impression of the O.T.C. communications satellite earth station to be erected at Carnarvon, W.A., showing the construction of the 60ft high casshorn type aerial.



The original "DUST BUG" (Regd.)

Automatic Record Cleaner. Easily fitted to any transcription type turntable — the "Dust Bug" provides a simple and effective method of removing static and dust while the record is being played. Surface noise and record and stylus wear is reduced resulting in cleaner reproduction.

The "PARASTATIK" DISC PREENER (Regd.)

Place 'Preener' on to recorded area and press lightly and evenly while the record slowly rotates.

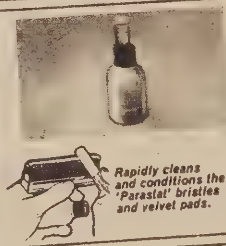
Expressly designed for use with new records and is able to collect all dust from the record surface without the use of anti-static agents. The plush pile penetrates each groove giving ideal playing conditions for ultra-light stylus pressures. Reduces background noise ensuring greater listening pleasure.

The "PARASTAT" Manual Model Mk. IIa.

Removes old residues from previous antistatic treatments—even from groove bottom.

Restores fidelity to older records. Nylon brush tips penetrate deep into the record groove removing dirt, grit and residue bringing old records to life and maintaining new records as new.

The "HUMID MOP"

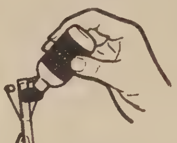


Rapidly cleans and conditions the 'Parastat' bristles and velvet pads.

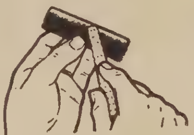
For use with the Manual "Parastat". Improves its efficiency in critical playing conditions especially when ultra lightweight pickups tracking at less than 2 grammes are used. Ensures that the surface of the record groove walls is maintained in a perfect playing condition. Should be used each time the "Parastat" is applied to the record.

NEW FORMULA "PARASTATIK" DISPENSER

Cleans and controls static — without surface film.



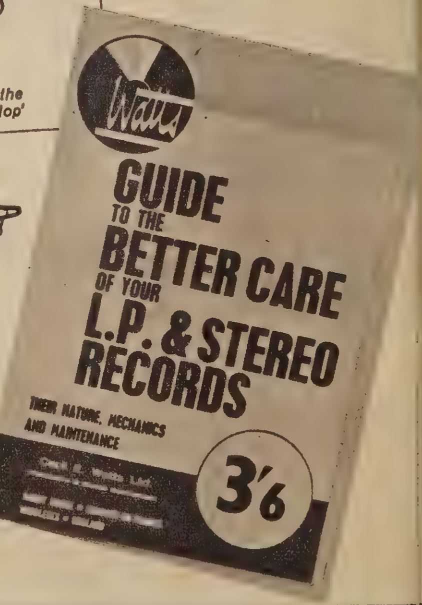
For normal use with "Dust Bug"



Reactivates the 'Preener'

Activates the 'Humid Mop'

THE ONLY COMPREHENSIV RANGE OF RECORD MAINTENANCE EQUIPMENT IN THE WORLD



Watts

GUIDE TO THE BETTER CARE OF YOUR L.P. & STEREO RECORDS

THEIR NATURE, MECHANICS AND MAINTENANCE

3/6

✻ Send today for your POST FREE copy of this informative WATTS publication . . . "Guide to the Better Care of your L.P. and Stereo Records". Price — 35c. Available from Simon Gray offices and representatives, good record stores and hi-fi centres.

Australian National Distributors :

Simon Gray Pty. Ltd.

Head Office: 28 Elizabeth Street, Melbourne, Vic. Tel. 63 8211, 63 8166
Sydney Office: 26 Ridge Street, North Sydney, N.S.W. Tel. 92 3890.

INTERSTATE REPRESENTATIVES:
N.S.W.: Audio Engineers Pty. Ltd., 342-344 Kent Street, Sydney. Tel. 29 6731
S.A.: Eilco Sales Pty. Ltd., 9 Osmond Terrace, Norwood. S.A. Tel. 3 6345
Q'land: Sydney G. Hughes, 154-158 Arthur St., New Farm, Brisbane. Tel. 58 1014
W.A.: Athol M. Hill, 613-615 Wellington Street, Perth. Tel. 21 7861
Tas.: K. W. McCulloch Pty. Ltd., 109 York Street, Launceston. Tel. 2 5322
A.C.T.: Australian Physical Laboratories, P.O. Box 225, Canberra City. Tel. 4 3010 (Mr. J. E. Howe)
N.T.: Pfitzner's Music House, Smith Street, Darwin. Tel. 3801

Technical Review

HEART TELEMETRY SYSTEM SAVES LIVES

The U.S. Air Force is testing a telemetry system to monitor cardiac patients continuously without keeping them in bed. The system is based on telemetry techniques developed in biomedical space programs. It was designed and built by Spacelabs, Inc., of Van Nuys, California.

Four patients at the Malcolm Grow clinical centre at Andrews Air Force Base have been turned into walking FM stations in a test of a system for constant monitoring of cardiac cases. Patient-monitoring systems aren't new, but most of them require that the subject stay in bed while data is transmitted over wires. Those which let him walk around provide for the recording of data rather than its continuous transmission. In the Spacelabs system, signals from electrodes attached to the patient are broadcast by lightweight transmitters, picked up by ceiling antennas, and passed on to a data room.

The data has both immediate and long-range uses. Brig. Gen. Archie A. Hoffman, head of the clinic, while cautious about evaluating the system after only a few months of operation, says that it has already warned doctors several times of impending crises. And James A. Reeves, executive vice president of Spacelabs, believes that the accumulation of data could eventually establish recognisable behaviour patterns that would give reliable advance warnings of heart attacks.

The system could monitor six patients. For reasons of cost, only four of the channels are equipped and now in use. At that, the Air Force may have got a bargain, for the Spacelabs' price tag of $60,000 ($A53,000), established in open bidding, was one-eighth that of the next lowest bidder.) In the current test, patients can wander through eight rooms, though the system could be extended for 48 locations.

A desk-sized console dominates the data room. On the slanted back panel are six horizontal rows of lights, one for each patient, giving location and condition. Also on the back panel is an oscilloscope which can be switched to the data being received from any one of the patients.

Alarms light up when a pulse rate becomes too fast or too slow, or when other factors exceed the established limits. Alarm lights also indicate loss of the telemetry signal or detachment of an electrode. An audible alarm is given in conjunction with the visual alarm.

A technician at the display console has a microphone to call for help if any patient goes critical. Help arrives in a matter of seconds, a vital factor in heart attacks.

Incoming signals are recorded on a seven-channel tape recorder (one channel for each patient and a seventh for the time of day). This provides a record for analysis of the sequence of events prior to, during and after an attack.

The tape becomes a research tool in helping to establish behaviour patterns. Direct visual readout of the electrocardiogram is continuously available on a multi-channel, strip-chart recorder.

The signal originates from three electrodes fastened to the patient with a special adhesive and then taped over for additional security. The output signal from the electrodes is boosted in an electrocardiogram (ECG) amplifier to drive a voltage controlled oscillator (VCO), which in turn drives an FM telemetry transmitter. The patient carries a battery-pack power supply and a 10in coiled antenna. The weight of all his equipment is about 18 ounces.

The electrode output is within the ±5 millivolt range and is increased to plus or minus one volt by the ECG amplifier. The VCO operates on a bandwith of 6.8 KC ±7% and frequency modulates a radio-frequency generator for transmission of signals.

Six transmitting frequencies in the IRIG telemetry band—232.4MC, 236.2 MC, 241.5MC, 245.3MC, 247.8MC and 252.4MC — are used for patient identification. Regardless of centre frequency, the bandwidth of the transmitters is five times that of the VCO.

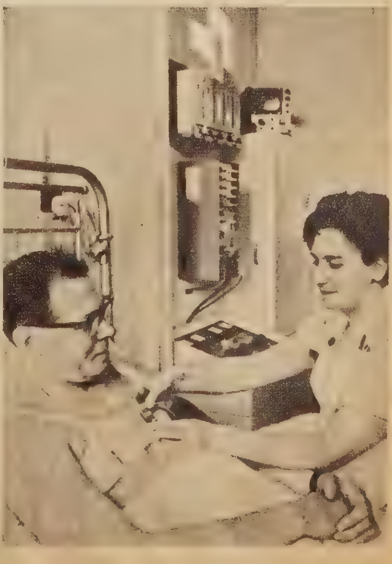
A battery pack powers the patient

(Continued overleaf)

WIRED MONITORING SYSTEM IN U.K. HOSPITALS

Hospitals in U.K. are using a wired patient monitoring system that can give a continuous indication of a patient's condition and will record the progress of the condition over a 24-hour period. The system, called "Monitron," is manufactured by T.E.M. Instruments Ltd., of Crawley, Sussex.

Electronic sensors are strapped to the patient's body to keep bedside equipment supplied with information about temperature, pulse, respiration and blood pressure. Any serious change in the patient's condition causes an alarm system to come into operation, which alerts medical staff. In the photograph, a staff nurse at Crawley Hospital is seen fastening a chest strap containing the electronic sensors to a T.E.M. Electronics development engineer, acting as patient during a recent demonstration of the equipment.



The "Monitron" is typical of equipment to be installed in a number of British hospitals this year for evaluation purposes. The equipment is expected to save the lives of many patients in whom a sudden change for the worse might otherwise go unnoticed.

ANNOUNCING THE NEW

Ferrograph

SERIES 6

Built in a tradition of excellence.

DESIGN FEATURES: **Three Tape Speeds** giving a wide range of playing time. • **Three Independent Motors** each designed for its specific task allowing exceptionally fast rewind and wind on times. • **Synchronous Capstan Motor** with ball races for extended maintenance-free operation. • **Tropical Treatment** given to all windings, motors and components to withstand operating conditions of high heat and humidity. • **Bilimboid Power Transformer** for lower hum levels. • **Large Spools** up to 8¼" diameter can be accommodated. • **Auto Stop Switch** halts at end of reel.

MODEL 631 A monophonic recorder/reproducer housed in a new-presentation two-tone grey case with metal trim and provided with an additional head position for Stereo playback, lower-track and monitoring heads.

MODEL 631H For users whose applications require adherence to the older standards of frequency response the Model 631H is available having speeds of 3¾, 7½ and 15 ins./sec. with CCIR characteristics corresponding to 200, 100 and 35 microseconds respectively.

MODEL 632 STEREO A stereophonic instrument with separate record, replay heads and amplifier systems and an output monitor stage with built-in speaker.

MODEL 632H STEREO A stereophonic instrument having speeds of 3¾, 7½ and 15 ins./sec. with recording characteristics similar to the model 631H.

MODEL 634 STEREO Provides facilities for twin quarter track recording and play back.

For illustrated literature and name of your nearest Ferrograph retailer write to:

AUSTRALIAN AGENT

TAPE RECORDERS PTY. LTD.

60 Clarence St., Sydney, N.S.W. 29.1571

OTHER STATES

VIC.: Melbourne Tape Recorders Pty. Ltd., 242 Elizabeth St., Melbourne.
QLD.: A. E. Harrold Pty. Ltd., 123 Charlotte St., Brisbane.
S.A.: Stephen & Company, 53 Wyatt St., Adelaide.
W.A.: O. F. Gamble Pty. Ltd., 888 Hay St., Perth.

transmitter system. It has a charge life of about eight hours and can be recharged while being worn by the patient.

Each of the eight rooms has a quarter-wavelength whip antenna suspended from a ceiling unit. The signal is fed through a phase shifter and a directiona coupler to a coaxial cable which connects the unit to the data room.

The phase shifter is driven by a self-contained oscillator within the bandwith of 44.2KC to 91.8KC. Each oscillator operates at a specific narrow frequency to identify a particular location. Any RF signal received, regardless of frequency, will be narrow-band frequency-modulated at the oscillato frequency.

Since the received RF signal from the patient's transmitter is already FM/FM, the signal that passes through the phase shifter will be FM/FM/FM.

Receivers in the data room are frequency-matched to the six patient carrier frequencies. When a signal passes through the proper receiver, the identifying carrier frequency is removed leaving only the 6.8KC data frequency and the local identification frequency.

The receiver has two output jacks One feeds the signal to a bank of narrow bandpass filters matching the location-unit oscillators. Each filter reject the 6.8KC data frequency and all bu the matching location frequency. When the signal finds and passes through the appropriate filter, a corresponding location light is displayed on the console in the patient's row.

The other jack routes the signa through a 6.8KC bandpass filter which rejects all the location frequencies and leaves only the FM data signal. The signal is demodulated, recorded on the proper channel of the tape, traced out on the proper channel of the strip chart and fed into the oscilloscope if the scope switch is set for that patient.

A fast-acting relay is held energised by a rectified component of the 6.8KC data signal. Loss of the signal wil allow the relay to become de-energised causing the "RF off" alarm light to be displayed in the patient's row. At the same time, the relay will ground the discriminator output from the signal demodulator so that the strip chart tracing pen will not be overdriven by noise.

Loss of an electrode will drive the data signal out of the acceptable 6.8KC bandwidth, and the resulting signal wil not pass through the bandpass filter Loss of the signal will be detected and the electrode alarm will light up. The relay circuitry is designed so that once energised, it will lock-in until manually reset.

At certain spots in the hospital, a patient could be in line-of-sight of three antennas, so that the console pane would show him in three differen rooms. Signal strength detectors could correct this problem.

Still, the patients are kept under almost continuous surveillance withou being wired down. Gen. Hoffman offered a "preliminary impression" tha the equipment will be of great assistance in the management of acute cardiac problems, and will even prove to be a saver of human life. Yesterday's electrocardiogram can't predict today's hear attack—but the continuous ECG can ("Electronics," Vol. 38, No. 14.)

COLOUR TV CAMERA WITH FOUR PLUMBICONS

A new colour television camera developed in England by the Marconi company has a number of interesting features which are summarised in this article. The camera, Marconi Mark VII, uses four Plumbicons as the pick-up tubes, this feature constituting a notable advance in design, the company claims. The camera also has an improved optical system for spectral separation which gives high transmission efficiency and a reduction of the colour distortion experienced with earlier systems.

Thin-film circuits are used extensively throughout the electronic circuitry of the camera, mainly to ensure stability of operation in a range of ambient temperatures. The main aim in the design has been to achieve a piece of equipment which is compact, light and simple to operate but, at the same time, gives pictures comparable in quality with those of image orthicon cameras. Compactness and simplicity of operation have been achieved by the use of pick-up ubes of the photoconductive type, in place of image orthicons, in association with the improved optical system.

The vidicon is the best known and most widely used photoconductive tube, but although it is excellent for film canning and many closed-circuit television applications it does not provide good pictures when used in broadcasting tudio cameras on scenes with ow illumination and/or rapid movement. The Plumbicon, however, which s an improved type of photoconductive ube, does meet the required standards of picture quality, particularly when used in a four-tube arrangement.

It is fair to say, in fact, that a four-ube Plumbicon camera gives better olour pictures than a three-tube orthicon camera.

The four-tube camera, which provides separate luminance channel, in addition to the three colour channels (red, reen, blue) of the three-tube camera, is ow coming into wider use because of ts undoubted advantages for compatible olour television systems. First of all, he extra tube provides a high-quality uminance signal (giving the luminance nformation for colour receivers and he black and white picture for monochrome receivers) which is independent f the optical registration of the colouring tubes. In a three-tube camera, in which the luminance signal is obtained y addition of wide-band signals from he three tubes, the fidelity of the luminance information (monochrome picture efinition) depends very much on the egistration of the three separate images, nd long term stability of the required ccuracy is, in fact, very difficult to chieve.

A further advantage of the four-tube ystem is that the luminance value in he reproduced colour picture is predominantly that from the luminance ube alone, and consequently picture egradation caused by colour tube defects is reduced.

All the four tubes in the camera are lumbicons. They provide compactness and simplicity of design because the Plumbicon is much smaller than the widely used 4½-inch image orthicon and requires less scanning and focusing power and less complex external circuits. The resolution of the Plumbicon (see appendix) is not quite as good as that of the 4½-inch image orthicon, but it is more than adequate for the narrow-band colouring channels and is satisfactory for the luminance channel.

Since the Plumbicon is superior to the vidicon in sensitivity, lag and dark current (the spurious, temperature-dependent flow of charge carriers in the photoconductive layer which can prevent good picture contrast), it is therefore a natural choice for the three colouring channels.

For the luminance channel the Plumbicon is not quite such an obvious choice. The highest quality black-and-white pictures at present attainable are given by the 4½ inch image orthicon, which, because of its non-linear characteristic, has the additional advantage that it can handle a wider range of scene illumination than the Plumbicon, with its almost linear characteristic.

On the other hand, because of these very differences in characteristics and other differences in performance and geometry, there would be considerable difficulties in achieving satisfactory registration and performance matching between a single image orthicon and the three colouring-channel Plumbicons. Thus four Plumbicons would seem the best compromise for combining satisfactory picture quality with minimum size and complexity of equipment.

The improved optical system (see figure 1) is characterised by its use of a prismatic type of light splitting system instead of plate-type dichroic mirrors, and by the use of relay lenses. The prismatic system for splitting the incoming light into luminance, red, green and blue components has been adopted partly because it occupies less space than the plate-type dichroic mirror system and partly because it avoids the ghost images, astigmatism, spurious colour gradation across the picture and unfaithful colour rendering with polarised light (e.g. in reflections from hair) which are commonly experienced with the plate system. The main function of the relay lenses, as their name implies, is to extend the length of the light paths from the main camera lens, which is a zoom lens, to the pick-up tubes.

This is necessary because, with a four-tube camera, it would be difficult to arrange the tubes and the light-splitting system so that the scene image could be formed directly on the tube targets by the main camera lens. In particular it is desirable to mount all four tubes as near parallel as possible and with similarly orientated images, in order to minimise the differential effect of external magnetic fields on them, and this would be almost impossible with direct image formation.

Furthermore, the direct method is operationally inflexible because the main camera lens has to be specially designed for it, whereas with the relay system any standard television camera lens can be employed.

In figure 1 the main camera lens forms a primary image of the scene (40mm diagonal, image orthicon size) in a field lens, which is the first component of the relay system. This image is then focused on to the targets of the four pick-up tubes through the various reflecting surfaces of the prismatic light splitting system. The first prism separates the luminance component by reflecting some of the light into the luminance tube and allowing the remainder to pass through to the colour tubes.

This separation, however, is not performed by a conventional semi-reflecting surface in the prism but by an interference layer, as in a dichroic mirror which reflects at each light wavelength only that part of the energy required by

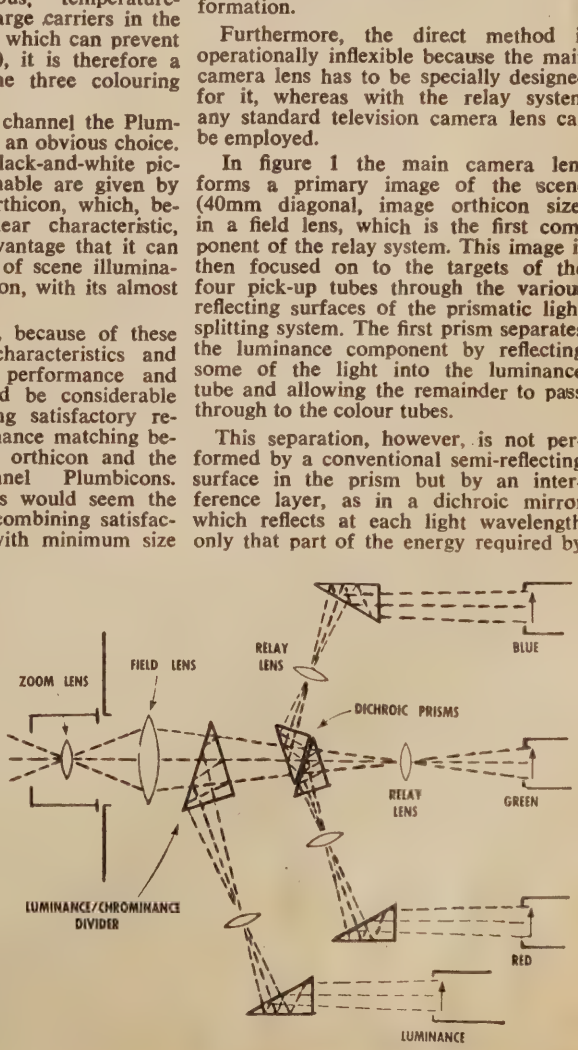
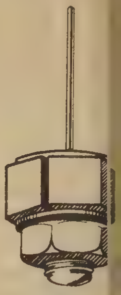


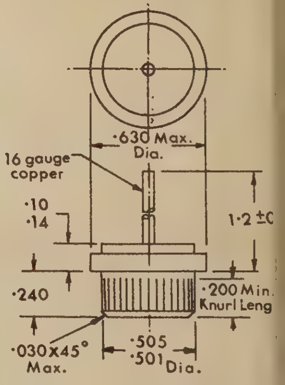
Figure 1. Simplified schematic of the optical system, showing relay lenses and prismatic separation lenses.

Low cost rectifiers for all medium-current Industrial applications



- ★ Australian made, readily available ex-stock.
- ★ Designed for high performance under severe conditions.
- ★ High surge handling capability, low leakage currents.
- ★ Corrosion resistant, hermetically sealed, press fit package.
- ★ Anode or Cathode to case types available, simplifies mounting.

The suffix "R" after type number denotes anode connected to case.



OUTLINE DIMENSIONS
IN INCHES

MAXIMUM RATINGS	IN3659 IN3659R	IN3660 IN3660R	IN3661 IN3661R	IN3491 IN3491R	IN3492 IN3492R	IN3493 IN3493R	UNIT
Peak inverse voltage	50	100	200	50	100	200	Volts
Sine wave R.M.S. supply voltage (Resistive load only)	35	70	140	35	70	140	Volts
Sine wave R.M.S. supply voltage (Capacitive or battery load.)	17	35	70	17.5	35	70	Volts
Average half wave recti- @ 100°C case fied forward current. @ 150°C case	30 25	30 25	30 25	25 18	25 18	25 18	Amp
Recurrent peak forward current (50 cps and 25°C case)	100	100	100	75	75	75	Amp
Peak one cycle surge current (50 cps and 150°C case temp.)	400	400	400	300	300	300	Amps
Forward voltage drop @ 25 Amp. D.C., Forward current	1.2	1.2	1.2	1.2	1.2	1.2	Volt
Average full cycle reverse current at rated P.I.V. and I.F. (Resistive load, 150°C case.)	5.0	4.5	4.0	10	10	8	mA
Thermal resistance junction to case	1.0° C/WATT TYPICAL						
Operating junction temperature.	+175° C						

ANODEON
SALES
A DIVISION OF ELECTRONIC INDUSTRIES LTD.

N.S.W.: 443 Concord Road, Rhodes. 73-02
VIC.: 153 Sturt Street, South Melbourne. 69-03

A 11

the luminance tube—in other words, the reflection process gives the correct spectral response curve for the luminance channel. Then at each wave-length the whole of the remaining light energy passes through to the colour separation prisms.

Thus the interference layer in the luminance prism combines the function of luminance/chrominance light division with the function of a spectral shaping filter (which would in any case be necessary), but without the loss of light energy that would result from the absorption in a conventional filter. This novel technique therefore ensures minimum loss of light energy and so increases the sensitivity of the camera.

When the camera is required for black-and-white operation only, the special luminance/chrominance separation surface is replaced by a fully reflecting surface—the prism being a dual-purpose one—so that the whole of the ncoming light energy passes into the uminance tube.

After the luminance component has been split off, the remaining light is eparated into its red, green and blue primary colour components by further nterference layers in the dichroic prism ystem. These components are then directed through further prisms, the relay enses and spectral trimming filters, to he appropriate pick-up tubes, where red, green and blue images are formed on he respective targets of the tubes.

Although the resolution of the Plumbicon is not quite as good as that of the mage orthicon, maximum resolution hrough the whole luminance channel 400 lines with 100 per cent modulation) s achieved partly by aperture correction, artly by special attention to the design of he tube scanning yoke, and partly by the se of a high focus-electrode potential in he luminance Plumbicon (750V instead f the 250V used in the chrominance Plumbicons) so that the scanning beam iameter is as small as possible.

The sensitivity of the camera is such hat, under average studio conditions and with average pickup tubes, 230 ft-candles (2,500 lux) of illumination on the scene s required with a lens aperture of f/8. This assumes an illumination colour temerature of 3000 degree K and a peak scene reflector of 60 per cent.) With these onditions the signal (p-p)-to-noise (RMS) atio is 40dB in the luminance channel bandwidth 5.5MC), 36dB in the red hannel, 44dB in the green channel and 7dB in the blue channel. With the iris pened to f/4 and the gain of all chanels increased by 6dB—this is done by a master gain control—an acceptable picture can be obtained with only 30 t-candles (325 lux) of illumination.

As already mentioned, the camera degn makes extensive use of thin-film circuits and this technique has been adoptd in order to achieve sufficient stability with a range of ambient temperatures to reduce the operational adjustments reuired to a minimum—what is known as hands-off" operation. Over 60 of these hin-film circuits are used. The circuitry completely solid-state, with the excepon of a single Nuvistor valve in each f the four vision head amplifiers—used ecause a transistor with a sufficiently good noise figure for this stage was not vailable.

As mentioned above the Plumbicon is photoconductive type of pick-up tube.

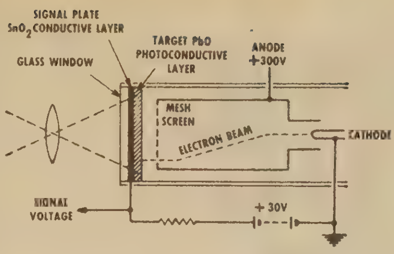


Figure 2. Basic construction of the Plumbicon pick-up tube.

It is similar in size and principle of operation to the vidicon but will give better pictures under unfavourable studio and outside broadcast conditions. Relative to the vidicon it has higher sensitivity, slightly lower resolution, faster response and lower dark current—the last-mentioned resulting in notable absence of black shading and accurate black level. The tube measures 19 cm long by 3 cm in diameter and the photosensitive target diameter is 2 cm. It has been given the name Plumbicon by its developers, the Dutch Philips company, because it has a photoconductive target made of lead monobide (vidicons normally use antimony trisulphide). The particular tubes used in the Marconi camera are of Philips manufacture but it is understood that the English Electric Valve Company, E.M.I. Electronics Ltd. and other companies will eventually be making Plumbicon type tubes in Britain.

The principle of operation is illustrated in figure 2. An image of the televised scene is focused on to the photoconductive target, which is scanned from the rear by an electron beam accelerated by a cylindrical anode (the mesh screen serving to give a more uniform field between target and anode). The target is formed on the glass window of the tube. A conducting but transparent film of stannous oxide (SnO_2) is first laid on the inner surface of the window to form a signal collecting plate, then a layer of lead monoxide (PbO) about 20 microns thick is evaporated on top of that to form the target. The signal plate is held at about 30V with respect to the cathode, which is earthed, while the free surface of the target scanned by the electron beam fluctuates within a few volts of cathode potential.

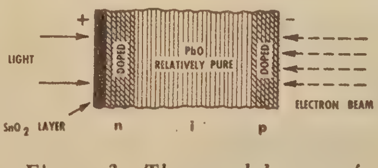


Figure 3. Three sub-layers of the lead monoxide target

What distinguishes the Plumbicon from the vidicon is not only the actual target material but the fact that the signal plate and target unit effectively forms three sub-layers, each of differing conduction type, as shown in figure 3. The wide inner sub-layer of the "sandwich" is almost pure PbO, which is an intrinsic semi-conductor, the sub-layer scanned by the electron beam is doped to make it p-type while the SnO_2 signal plate is strongly n-type and gives rise to a thin n-type region in the PbO. Thus when the tube is in operation the whole structure constitutes a reverse-biased p-i-n diode across which an electric field and capacitance exists.

This capacitance across the target can be considered as being made up of a large number of small capacitors, one at each picture point of the image. Shunting each capacitor is a small current source formed by the charge carriers — electrons and holes — liberated in the target material by the incident illumination at that point. When the electron beam connects with the right-hand plate of a particular capacitor, this capacitor starts to charge from the 30V supply.

As soon as the beam has passed on the capacitor starts to discharge through the shunting current source and the rate at which it discharges depends on the flow of photo-current and hence the intensity of illumination at that point. Thus when a capacitor is being charged through the electron beam, the charging current which flows from the 30V supply is proportional to the extent of the previous discharge and so to the intensity of the light. This charging current flows through the external resistor and so develops a signal voltage across it proportional to the light intensity at the picture point being scanned.

The good sensitivity of the Plumbicon (300 μA/lumen) results from the fact that there is a high electric field strength throughout the thickness of the target because the major part of it consists of i-type material, which is a poor conductor. Thus almost all the charge carriers liberated in the PbO by the incident light are caused to drift by this electric field and so contribute to a photo-current. The dark current is the small inverse current through the reverse-biased diode, and is extremely low ($<0.5\times10^{-3}$ μA) because of the blocking action of the p-type and n-type sub-layers to spurious current (i.e., electrons and holes not generated by light activation). The p-sub-layer hinders the entry of electrons into the i-sub-layer while the n-sub-layer hinders the entry of holes.

Other characteristics of the tube — resolution, speed of response, spectral characteristic — are determined by the properties of the target sub-layers, i.e., their thickness, doping substance, and so on. With a well-designed scanning yoke, a resolution of 400 lines with 40 p.c. modulation can be obtained. Speed of response to movement in the televised scene (i.e., change of light intensity on an area of the target) is limited by the ability of the electron beam to supply charging current during its brief connection to each picture-point capacitor and by the presence of traps in the i-sub-layer. The response is such that the change in tube signal level resulting from a transition from strong to weaker illumination of an area of the target is 95 per cent complete after 0.06 second. The spectral response of the standard tube is somewhat unsatisfactory at the red end of the spectrum (this is partly offset by increasing the gain in the red channel of the camera) but a new Plumbicon with improved red response is likely to become available within the next year.

(Wireless World, February 1966) ■

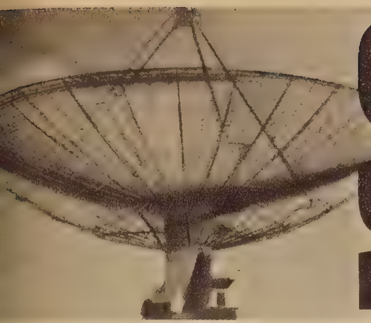
CAN YOU AFFORD NOT TO INSTALL Mullard LUMENAR LONG LIFE PICTURE TUBES?

- GUARANTEED FOR 12 MONTHS
- BUILT WITH SELECTED RE-PROCESSED GLASS BULBS
- PROVIDED WITH NEW GUNS

Where low cost is the prime consideration LUMENAR Picture Tubes are the complete answer. Where only the best will do, however, whether as the result of public demand or your own policy, give your customers PANORAMA *Radiant screen* — the superlative television picture tube used by leading manufacturers.

Mullard

MULLARD-AUSTRALIA PTY. LTD. ● 35-43 CLARENCE STREET, SYDNEY, N.S.W., 29 2006.
123 VICTORIA PARADE, COLLINGWOOD, N.5, VIC., 41 6644
Associated with MULLARD LIMITED, LONDON



SCIENTIFIC AND INDUSTRIAL NEWS

Space station open to public

The Tidbinbilla Deep Space Tracking Station near Canberra, is now open to the Public twice a week, tours being conducted on Wednesdays and Fridays. Tidbinbilla is the first of the three NASA (National Aeronautics and Space Administration U.S.A.) tracking installations programmed for the Australian Capital Territory. It is operated and maintained by Space Track Pty. Ltd., wholly owned by Hawker De Havilland, A.E.I. Engineering Pty. Ltd., and Elliott Automation Pty. Ltd.

The Deep Space Instrumentation Facility at Tidbinbilla was erected to provide another link in the world-wide network which supports the prime control centre of the Deep Space Research Program in America. Among its outstanding accomplishments to date have been radar observations of several planets, tracking the Mariner mission to Venus and receiving the television photographs from Ranger.

Almost 100 people are employed on the Station. The main feature of Tidbinbilla is the 85ft diameter 200-ton antenna. Tidbinbilla was completed in December, 1964 at a cost of $1.5 million and is contained within an area of about 10 acres. The annual operating cost of the Station is about $1,200,000.

S.T.C. supplies Alabama TV

Adult educational TV classes will soon be telecast to thousands of viewers in the American southern state of Alabama on microwave radio equipment recently ordered from Standard Telephones and Cables Pty. Ltd., Liverpool, N.S.W. The export order, one of the most unusual received by S.T.C., is valued at approximately $60,000.

The microwave link will operate between the cities of Mobile and Dozier—a distance of about 175 miles. To cover this territory, seven repeater stations will be built, at thirty-five mile intervals, as well as a transmitter station at one end of the link and a receiver station at the other.

The educational programs provided by the Alabama Educational TV network are designed to cater for numerous minority interests which could not be economically satisfied by individual commercial TV stations. Typical programs include complete orchestral concerts and operas; updating of professional nursing and baby health care; basic electronics course; schools programs such as speech improvement and nature study; "public service" telecasts by State cabinet heads to explain the functioning of their departments. After-school sessions for teacher training are also provided, to explain new educational ideas and theories.

The network was established by law in Alabama in 1953, as a State agency charged with the responsibility of making educational TV available to inhabitants of Alabama and promoting its use.

IBM computer expansion

IBM Australia has announced plans to quadruple the computing power of its Scientific Service Centres in Sydney and Melbourne. A large new computer, an IBM System/360 Model 50 costing $1.2 million, will be installed early in 1967 in the IBM Scientific Computing Centre at St. Kilda, Melbourne to cope with increasingly complex data processing problems of industry, business and research.

Until recently the Melbourne centre shared an IBM 7044 computer with Melbourne University. The machine has now been moved to the University's department of computing for full-time use by the University. The System/360 will take over from the 7044 the increasing load of scientifically orientated problems requiring attention at the centre.

To increase computing facilities for the processing of scientific problems in the Sydney area, IBM will use part time the facilities of an IBM System/360 Model 50 at the University of New South Wales. This computer will be installed and operating at the University in the second half of this year.

Computer gift to Sydney University

A gift of a 7040/1401 computer, worth $1 million, has been made to the University of Sydney by I.B.M. Australia Pty. Ltd. The acting vice chancellor of the University, Emeritus Professor W. M. O'Neill, said the equipment would make available a wide range of programs for research computations, and that the Fortran and Cobol compilers to be supplied with the equipment would be of considerable help for teaching purposes.

The 7040/1401 computer installation includes (in addition to the 7040 processor (with 32,384 words of store) and the 1401 processor (six magnetic tape units, a line printer, a card reader and a card punch). Delivery is expected towards the end of 1966. The University's current computing installation has been operating on a three-shift basis for the last four months, and consequently it is expected that the addition of the 7040 to the installation will be a very great help in handling the rapidly increasing load.

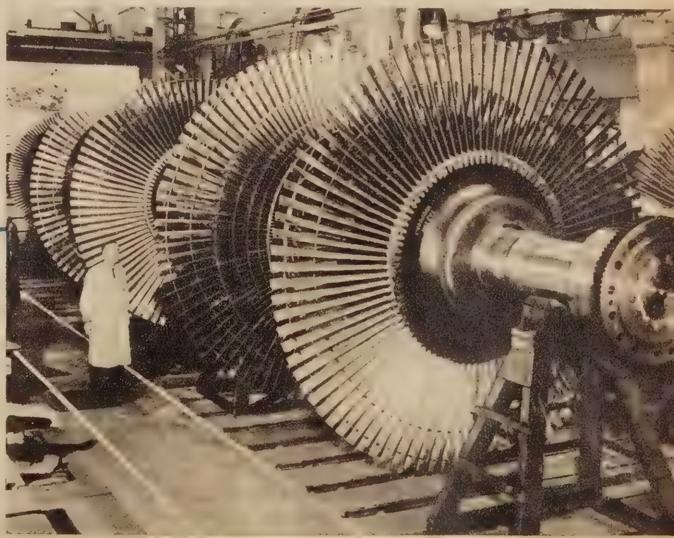
Pipeline instrumentation

The Foxboro Company, of Massachusetts, U.S.A., will supply instrumentation for controlling pumping stations on the new Trans-Alpine pipeline between Trieste, Italy and Ingolstadt, West Germany, now under construction.

Foxboro will supply electrical Consotrol instrumentation systems for each of the five completely-automatic pumping stations on the 40-inch, 285 mile line.

The pipeline — Europe's largest — will have three tunnels in Austria at altitudes of 3,050, 3,300 and 5,084 feet. The pipeline runs from Trieste on the Adriatic Sea, through Northern Italy and Austria to Ingolstadt, Bavaria. Foxboro Auto-Selector Systems will control discharge pressure and provide automatic protection against low suction pressure at each pumping station. The Foxboro systems will balance the loading on the pumps, which are connected in parallel, at each station.

The Foxboro Company recently established manufacturing facilities in Australia, at Lilydale, Victoria. Sales agents continue to be the already established company Foxall Instruments Pty. Ltd., Armadale S.E. 3, Victoria.



Low pressure rotors for one of the four 350MW steam alternator sets being supplied by English Electric Company for the Electricity Commission of N.S.W. Munmorah power station are seen here in the English Electric works at Rugby, England. These 36in long high-tensile steel blades exert a centrifugal pull of over 100 tons each when the turbine rotates at its operational speed of 3,000 r.p.m. English Electric Company has also supplied generating plant to other major E.C. of N.S.W. power stations, including two 100MWsets for Tallawarra and three 200MW sets for Vales Point. The Commission recently ordered from the company four 500MW sets for the new Liddell power station, now under construction on the northern coalfields.

WARBURTON FRANKI

MICROPHONES

Australian-made Crystal. Hand held type supplied in box with stand adaptor and 8½ feet cable.

£1 or $2 Post Free

FAMOUS ITALIAN GELOSO CRYSTAL

Will fit Australian type Mic. Stands. Attractive white plastic case and supplied in box with 7½ feet cable and phone plug.

£2/10/0 or $5 (Post Free)

IMPORTED DYNAMIC

Egg-shaped with built-in stand—Hi-Impedance—supplied in box with 5½ feet cable.

35/- or $3.50

(Post Free)

MULTIMETERS

Well-known type 200H. Fan-shape meter movement.

Ranges:—

D.C. Volts: 5, 25, 50, 250, 500, 2,50 at 20,000 o.p.v.

A.C. Volts: 10, 50, 100, 500, 1,000 10,000 o.p.v.

D.C. Current: 50 U.A., 2.5 M.A 250 M.A.

Resistance: .6K, .6 megohm.

Capacitance: 10 PF to .1 MFD.

Decibels: Minus 20 to plus 22.

Supplied in box with leads and batter

£5/10/0 or $11 (Post Free)

EVEREADY JUNIOR SCIENCE KITS

Introduction to Electricity. Full of interest to all ages. Kit includes: Magnets, Compass, Electric Motor, Iron Filings, Wire Coil, Clips, Wires, Sockets, Lamps and Holders, Batteries and full-colour 52-page Instruction Book.

$6.25 or £3/2/6 each Plus Pack and Post 2/6

GANGED POTENTIOMETERS

20K Log plus 20K log.
25K Linear plus 25K Linear.
100K Log plus 100K Log.

5/- each or 50c. (Post Free)

PICK UP ARM

Complete with turnover Crystal Cartridge.

25/- or $2.50 (Post Free)

PICTURE TUBE BOOSTERS

Give your picture tube a new lease of life by installing an easily fitted booster. If your picture lacks contrast and brightness you need a picture tube booster. When ordering, state whether 70, 90 or 110 degrees, or the type number of the tube.

70 deg. and 90 deg. type, 35/ or $3.50
110 deg. type . . . . . 38/6 or $3.85

(Post Free)

GUTTER GRIP CAR AERIALS

Australian made — Supplied c/ lead and plug to suit most Transisto Radios.

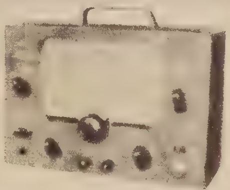
37/6 or $3.75 (Post Free)

PICKUP CARTRIDGES

Ronette Monaural with **Diamon** L.P. Stylus and Sapphire Std. 7 Stylus.

59/6 or $5.95 (Post Free)

SIGNAL GENERATORS



FAMOUS LEADER LSG11

£15 ($30)

(Including tax and freight.)

The LEADER LSG-11 is a general purpose signal generator having features which make it most useful in testing, checking and experimenting with radio and audio frequency circuits. Calibration accuracy is plus-minus 1% below 30Mc and plus-minus 3% to 390Mc. This feature permits easy alignment and checking of tuned circuits, IF amplifiers, etc.

Wide frequency range: 120 Kc to 390 Mc, Stable Colpitts oscillator with buffer stage. Two audio modulation frequencies. Provision for quartz crystal. Clear scales for frequency calibation. Compact and rugged construction. Attractive heavy steel cabinet.

SPECIFICATIONS:

Frequency Range	**120KC-130Mc on fundamentals.**
Calibrated Harmonics	**120-390Mc.**
R.F. Output	**0-100,000uV, adjustable (120Kc-38Mc).**
Modulation Frequencies	**400 and 1,000cps, A.F. Output adjustable.**
Crystal Oscillator	**1 Mc to 15 MS.**
Tube Complement	**1-12BH7 1-6AR5.**
Accessory	**1-75ohm Cable.**
Power Supply	**AC 50/60 cps.; 100V, 115V or 230V as specified; 13VA approx.**
Size and Weight	**27.5 x 19 x 11.5cm; 2.75 kg (6.1lb) 10¼in x 7½in x 4½in).**

GELOSO COIL KITS

MODEL 2676 — 5 BANDS — COVER FROM 520Kc to 18.5Mc. You get. ● Wired Coil Bracket and Switch ● Pair 455Kc IF Transformers ● Two-Gang Tuning Condenser with built-in Trimmers ● Complete Dial Assembly with Calibrated Dial Glass 3¾in x 4¼in. ● Descriptive Leaflet with Circuit.

£7/10/- ($15) Inc. Pack and Post.

WORLD FAMOUS POLYPACS

1 Dollar (10/-)

Famous one-dollar paks—brand new—no "rubbish."

Ideal for amateurs, beginners, servicemen, enthusiasts.

1. 30 carbon resistors, asst. ½-watt and 1 watt, presets, too. One dollar (10/-).
2. 20 asst. capacitors. 5 each paper, plastic, mica, ceramic. One dollar (10/).
3. 20 silver mica capacitors, inc. 5 per cent values. One dollar (10/).
4. 20 styroseal plastic capacitors, 20 per cent and 10 per cent. One dollar (10/).

Guaranteed A1 quality. Popular brands.

*1 pak, postage 5d; 3 paks, post free.

MAGNAVOX SPEAKERS

All Models Available from Stock —
Write or call for Data Sheet.

HF5SIC Tweeter — 7.5 or 15 Ohm	**52/-**	**($5.20)**
6WR 7.5 or 15 Ohm	**£6/11/6**	**($13.15)**
8WR 2.7 or 15 Ohm	**£7/2/6**	**($14.25)**
12WR 2.7 or 15 Ohm	**£7/12/6**	**($15.25)**

POST FREE

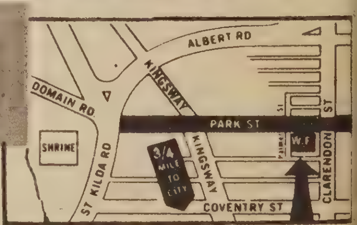
CRYSTAL DIODE RADIOS

Boxed with Earplug and Aerial Lead. **19/11 ($1.99).** Plus Pack and Post 6d (5c).

TELECOMPONENTS

W.F. have been appointed distributors of the well-known range of "Telecomponents" Television and Radio Transformers. Full stocks available.

WARBURTON FRANKI



220 PARK ST., STH. MELB., VIC. - - 69-0151

● Please include postage and freight with all orders. ● Trade also supplied

Plastic wire coatings

Quick-curing plastic coatings can be applied to wire at the rate of 250 feet per minute, claims Pennsalt Chemicals Corporation of 3 Gateway Center, Pittsburgh 2, Pennsylvania. This is said to be three times as fast as the application of paint. The wire is drawn through an alkali bath for electrolytic cleaning, then into the coating machine. A metering die applies the wet plastic, which is cured instantly by heating to 425 degrees F.

Italian copying lathe

A fully automatic copying lathe, which can produce two identical components, or two entirely different components simultaneously, and is claimed to have a production rate equal to the combined output from any two conventional copying lathes, is the latest machine to be produced by Eridi Giovanni Canavese, of Crema, Italy.

The machine incorporates a two-spindle system. Both spindles can be operated simultaneously, when the machine is fitted with an automatic loader, and it is also possible for one spindle to be manually loaded when the other is engaged in an automatic machining operation. Components of various shapes and sizes in both ferrous and non-ferrous metals can be machined to an accuracy better than 0.0005in and one semi-skilled operator can control two or more machines.

Radio link for remote hospital

The world's most remote hospital, 13,000ft up the slopes of Everest, is to have two powerful radiotelephones to provide a "lifeline" with civilisation. Sir Edmund Hillary will lead a New Zealand expedition into Nepal next year to begin construction of a six-bed hospital for 4,000 Sherpas in the Khumba area of the Himalayas. The expedition will carry with it two compact single-sideband transmitter-receivers, manufactured by Pye, of Cambridge, U.K., which will give hospital staff a vital link with Kathmandu, 160 miles away. The sets, Pye SSB 125s, have been presented to Sir Edmund by Mr G. A. Wooller, managing-director of Pye (New Zealand) Limited.

Acknowledging the gift, Sir Edmund said that to take a message to Kathmandu and return required a journey lasting eight days each way, so the radios would be an invaluable asset.

Another vital link for the hospital, which will be at Khunde, near the Tibetan Border, is an airstrip which Sir Edmund and his party built last year, a day's walk down the valley from the village. The radiotelephones will make it possible for the hospital staff to give pilots advance information on weather conditions in the valley. "This is particularly important," says Sir Edmund, "because the weather conditions there can change very quickly, and pilots are reluctant to leave Kathmandu for the valley unless they are sure that the weather is favourable."

Trans World Airlines are to have a Burroughs Corporation D830 computer system for on-line data processing of passenger reservations and simultaneous planning of flights, flight movements, crew and meal scheduling and other operational functions. Agents all over U.S.A., numbering about 2,000, will have cathode ray tube sets similar to that illustrated to give instantaneous access to the computer system. These sets eliminate the need for written records by electronically entering and retrieving reservations information directly from the computer system. The passenger's name, address, itinerary and special travel requirements are presented on the screen as the operator enters the information by means of the keyboard.

Interested Asiatic students examine the newest aid to language teaching installed at the Isleworth Polytechnic College, London. The device incorporates an electronic drum which allows a lecturer to give personal coaching to students in 16 separate booths, without the necessity for individual tape recorders. The magnetic drum is the only moving part, and the makers, International Tutor Machines Ltd., of Ashford, Middlesex, claim that it is capable of running for 15,000 hours without overhaul.

High-power CW Laser

A continuous, solid state laser beam operating at a power level in excess of 40W has been achieved by Union Carbide Corporation at Speedway Laboratories, Indiana, U.S.A. This is the most powerful continuous wave (CW) laser beam yet reported, exceeding previously reported power levels by a substantial margin. The laser crystal used is a neodymium-doped yttrium aluminium garnet (YAG) produced by the Crystal Products group in Union Carbide's Electronics Department. This type of crystal, made available in June, 1964, has a low pumping threshold and is especially suited for CW applications. The laser output is at a wavelength of 1.06 microns.

The pumping source is a high-intensity radiation device recently developed at the same laboratories. This unique arc system proved to be the key element in achieving high laser beam power. It can provide high intensity radiation in forms of line source (as opposed to a point source) at any desired level of radiated power up to 50kW. Other critical requirements are effective water-cooling of the crystal and the design and maintenance of precise geometrical relationships between the source, the crystal, and associated optics.

value
C8MX
performance
12PX
unexcelled
ROLA
12UX

stereo-3 WAYS

From ROLA — three multiple-cone speakers to choose from. Each combines outstanding frequency response with high power handling capacity. Each has special advantages. Perhaps the 8-inch C8MX is ideal for your needs. Teamed with the ROLA "Slimline" enclosure it provides a low-cost, compact system. The 12-inch models 12PX and 12UX require larger cabinets, but offer more bass. The 12UX, of course, is the finest though not the most expensive hi-fi speaker you can buy.

Plan your new hi-fi system or upgrade your present one with ROLA speakers. Full technical specifications and enclosure details are available — from ROLA or ROLA distributors.

A Division Of The
Plessey Components Group
ROLA COMPANY (AUSTRALIA) PTY. LTD.
THE BOULEVARD, RICHMOND, VICTORIA. N.S.W. OFFICE: CHRISTINA RD, BOX 2, P.O., VILLAWOOD.

SCIENTIFIC NEWS — cont.

Colour-sensitive film

The Minnesota Mining and Manufacturing Company, of 3M House, Wigmore Street, London, W.1., has introduced a light-sensitive material in the form of film, from which negatives or prints can be made by contact. It is Orange Colour-Key. It consists of a pigmented light-sensitive material on a clear polyester base. It will not stretch, shrink, buckle or fade and needs no drying time. The original—a transparency, a picture or design on thin translucent paper—is placed in contact with the Orange Colour-Key and exposed as with ordinary contact printing. The film is then developed by wiping away the image with a colour-key developer. The material can be used for letters, visuals, silk screening, printed circuits and engineering drawings. No darkroom or camera is required.

Hard coating for tools

A succession of sparks carries particles of ungsten carbide and deposits them on a surface to be wear-proofed in a process announced by Selectrons Ltd., of 116 East 16th Street, New York. Electric discharges tear the carbide from an electrode and heat the particles enough to fuse with the workpiece, which serves as the other electrode. Selectrons claim the method can be used to surface machine tool cutters, saws and dies, giving them a life three to 10 times as long as untreated tools.

Infra-red for soldering

Infra-red light concentrated by mirrors s used for soldering in order to keep temperatures down and avoid contamination. The method developed by Argus Engineerng Company of Hopewell, New Jersey, U.S.A., focuses heat rays by an elliptical mirror. Soldering can be done as low as 00 degrees Fahrenheit, less than 50 degrees above the melting point of the solder. Varyng the intensity of the infra-red lamp permits close control when working on heat-ensitive electronic devices. Since nothing but the heat rays touch the joint, there is no danger of contaminants, carried by soldering irons affecting the joints.

Plastic pipes

Double-walled plastic pipes that are easy o assemble, non-corrosive and able to withtand high pressures are being subjected to ull-scale trials in South Africa by the Council for Scientific and Industrial Reearch, P.O. Box 395, Pretoria. It claims hat they are especially suitable for disharging sewage and chemical sludges and turdy enough for a host of other engineerng applications.

Each pipe consists of two concentric ubes of rigid polyvinyl plastic, with a welded steel framework that keeps them apart and cement filling the space between. For discharging waste offshore the hollow tubes and framework are towed out to sea and there sunk in their trench before the cement is pumped in. When they must withstand high pressures, the amount of steel in the framework can be increased to give the required reinforcement. For overhead work, fillers other than cement can be used.

Resin for emulsion paint

A very versatile vinyl acetate acrylate copolymer resin has been produced by British Resin Products, Devonshire House, Piccadilly, London, W.1. Labelled Epok V-8007 it is intended for polyvinyl acetate emulsion paints that are heavily loaded with pigment.

It is claimed that paints with 65 to 75 per cent pigment volume concentration have been produced with the new resin to cost as little as 62c per gallon. The resin produces film very quickly. It has very good low-temperature properties and is suitable in paints for interior and exterior use.

A school with its own broadcasting system is the boys' secondary school at Crown Woods, near London. Although the station never goes on the "air," because it relays its programs only through the school public address system, it operates on established broadcasting station principles, with pupils acting as announcers, interviewers, studio managers, artists and administration assistants. Here, a teacher and budding technicians are busy in the control room.

Better gasfield

Natural gasfields could be made to yield up to 600 per cent more than they do normally by means of underground nuclear explosions, according to the United States Atomic Energy Authority. The authority has completed feasibility surveys which suggest that 10 kiloton nuclear explosions—equivalent to 10,000 tons of TNT—could be set off in gasfields at depths down to about 5,000 feet to form subterranean gas reservoirs. The method will now take some years to evaluate for safety. But basically it is no more than an extension of an existing practice of using conventional explosives to improve gasfield yields and of the method, particularly developed in France, of storing both natural and industrial gases in underground caverns.

Low-temperature batteries

Primary batteries which give a steady voltage from 40 degrees F below zero to 125 above are under development by Eagle-Pitcher Company, American Building, Cincinnati 2, Ohio. The batteries use magnesium and magnesium perchlorate and are said to have "relatively high efficiency at discharge rates from two to 100 hours." At low temperatures they need no auxiliary heaters.

Measuring dust in the air

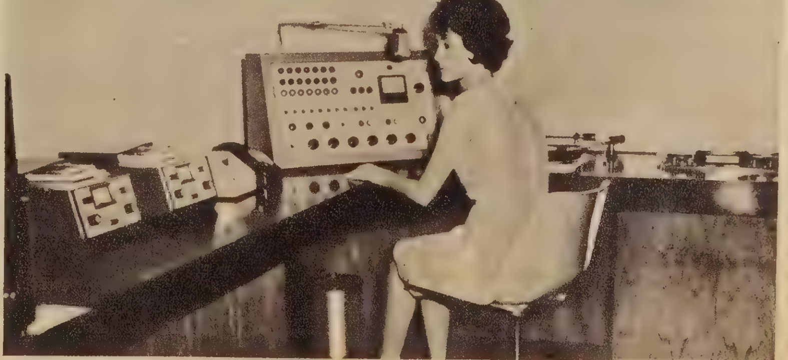
Hospital operating rooms or the "clean rooms" of industrial assembly plants are expected to be the market for a direct-reading electro-optical dust counter. The device, from Bausch and Lomb, 635 St. Paul Street, Rochester 2, New York, directs a cone-shaped beam of light into the stream of air containing the dust. Particles in the air scatter the light and the amount diverted from the beam is measured to report on dust concentration. The counter is said to be effective with as little dust as a few particles per cubic foot.

New Australian ceramics

Two ceramic materials have been developed by the Division of Building Research of C.S.I.R.O., Melbourne. One is based on basalt and the other on lightweight aggregate from shale or clay.

Waste basalt fines are bonded with clay slip, cast in moulds and fired at 1,100 to 1,200 degrees C. The result is superior to cast basalt in resistance to thermal and mechanical shock and is much cheaper. Refractories can be made in a similar way by incorporating zircon. This material is suitable for flooring in food factories, and chemical, metallurgical and industrial plants, linings for blast furnaces and so on.

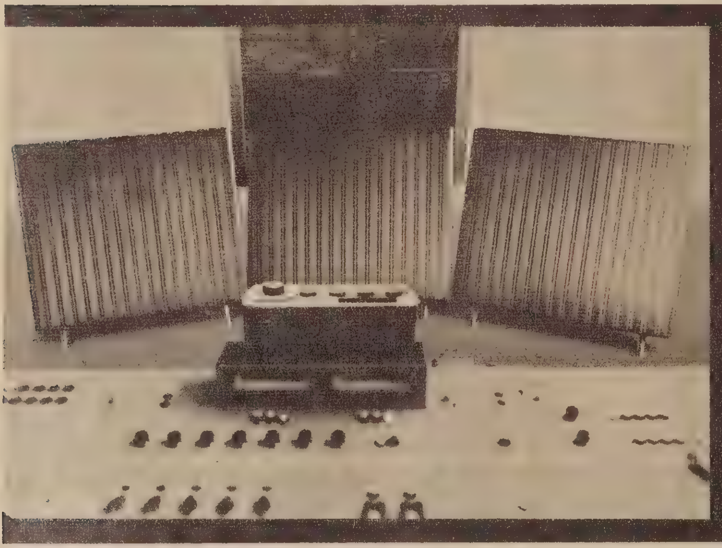
The second material is made by firing powdered glass and light-weight aggregate at 900 to 950 degrees C. The resulting material can be nailed. Bricks and blocks made of it are light and have good thermal insulation.



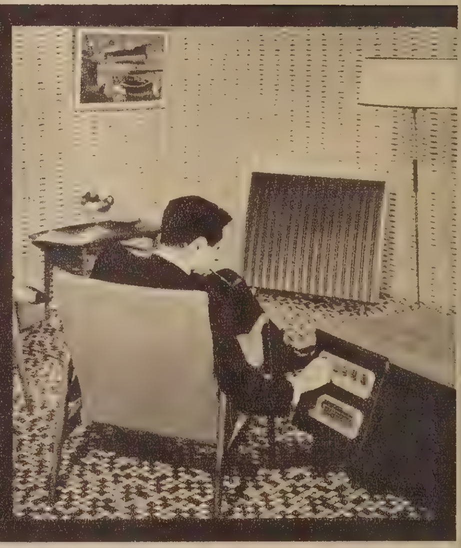
A new public address system at Kuala Lumpur Airport, Malaya, which was supplied and installed by Amalgamated Wireless (Australasia) Ltd., is claimed to be one of the largest airport P.A. systems in use anywhere in the world. More than 960 loudspeakers are used in a low-level audio system, and all equipment besides loudspeakers is centralised in the control room. The main control console pictured here has switching to allow selection of areas to which a message will be relayed, and a system of "busy" lights to indicate when one of the subsystems in the "Inwards," "Outwards" or "Transit" areas is already in use.

THROUGHOUT THE WORLD.....

QUAD is used professionally
to ensure the highest quality
of reproduction in music.



Monitoring with QUAD equipment
at the Lucerne Music Festival.



. . . and in your own home, too. QUAD gives
the closest approach to the original sound.

QUAD *for the closest approach to the original sound*

At Lucerne, Quad II Main Amplifiers and type 22 Stereo/Mono Control Unit were used to drive three Quad Electrostatic loudspeakers, as above. The illustration on the right shows the 22 Control Unit and a Quad Radio Tuner driven by a Main Amplifier to one Electrostatic loudspeaker.

For illustrated literature and name of your nearest Quad retailer, write to:

Sole Australian Distributor

BRITISH MERCHANDISING PTY. LTD.

60 Clarence St., Sydney. Telephone 29.1571.

Beating car thieves

A new system to defeat car thieves is currently being evaluated by car manufacturers in Britain. It consists basically of a small black box designed to slip into the radio slot of a car, or to be riveted under the fascia. This takes the place of the ignition starter switch, and contains the high tension coil. On the face of the box are mounted three knobs with 12-position dials. Before the starter can be operated, the correct combination must be dialled on the knobs.

Adhesive film that slides

A pressure-sensitive adhesive applied to a film, but easy to slide about before pressure is applied, is available from the 3M Company, 3M House, Wigmore Street, London W.1. The main purpose is the application of emblems. Many such self-adhesive labels stick at once when the backing paper is removed, and so if there is any error in positioning it cannot be corrected. The new Controltec No. 9650, on the company's Scotchcal film, avoids this difficulty. Labels can be moved about freely until correctly positioned. Then pressure is applied with a oller. The development is to meet the needs of airlines, transport fleet operators, sign companies and so on.

Australian-made subscriber message registers are to be supplied to the Taiwan Telecommunications Administration following the placing of two substantial orders with Telephone and Electric Industries Pty. Ltd., of Meadowbank, N.S.W. T.E.I. is a member of the Plessey Telecommunications Group in Australia. Here, a technician is checking part of a battery of message registers undergoing final testing at the Meadowbank factory. Every register must complete 50,000 registrations under adverse limiting conditions of current and length of impulse before being accepted for service.

Computer for aircraft evaluation

A Ferranti-Rocher flight trials recording system is to be used by Hawker-Siddeley Aviation Ltd., in U.K., for evaluation of igh-speed aircraft. The system records and processes the results of aircraft flight trials. The airborne unit accepts measurements of parameters such as temperature, pressure, acceleration, strains and angular displacements, via 512 measurement channels which are sampled once every second.

On the ground the recorded information s processed on a Ferranti Hermes computer nd stored on magnetic tape backing store. he output is presented on one or more igital incremental plotters or on paper tape, for interpretation by instrumentation and aeronautic engineers.

By using the flight trials system there is a great saving of time between each aircraft test flight as all the channels on a tape from a 90-minute flight can be replayed in about 12 minutes in block format on to a backing store tape. During this time the Hermes computer can process the data from a limited number of channels which are predetermined by the user for each flight. For example, a program may be used during flight tape replay which only looks for the maximum and minimum values of the channels which have been selected.

The data on the backing store tape is also in a form suitable for replay into the computer, where calibrations and aerodynamic calculations are carried out and the results plotted in graphical form on a digital incremental plotter.

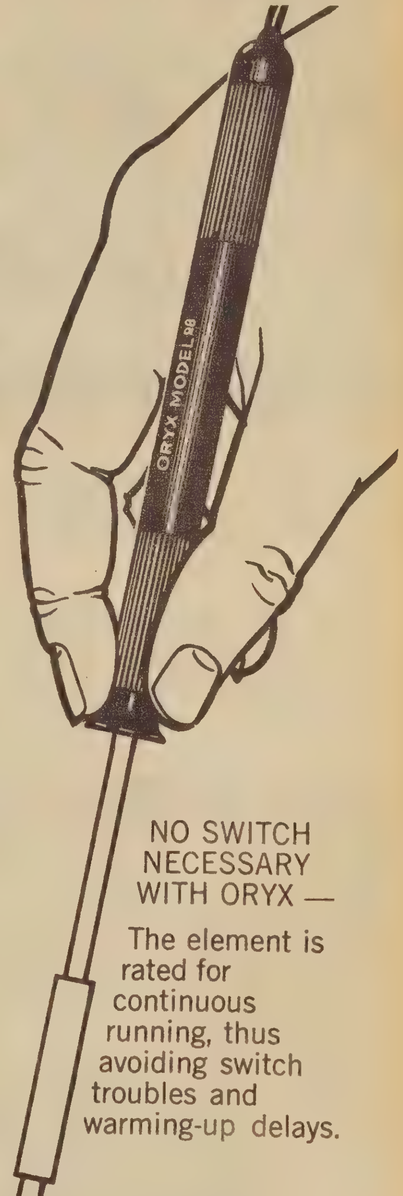
As with human beings, early diagnosis of incipient complaints in motor cars can prevent more serious trouble later on. The electronic amplifying stethoscope pictured allows the detection, even in the early stages, of wear or misalignment in moving parts, checking to ensure precision fitting of machined parts, and detection of vibration. Called the "Minearscope," it is manufactured by Minear Holdings Ltd., Selsey, Sussex, England.

AWA test sets on display

Modular test sets developed by Amalgamated Wireless (Australasia) Ltd. for testing various types of radio equipment, were exhibited in special displays staged by the Department of Trade at recent Trade Fairs in Rotterdam, Holland, and Milan, Italy. Three types of set were shown, developed by AWA to overcome the problems of size, weight and transportability in testing equipment.

Transmission measuring set, Type A220, is designed to evaluate audio and carrier frequency systems. Test set A410 is for use on FM, VHF/UHF equipment. The third set displayed, Type A310, is for tests on MF/HF equipment, and is said to be well adapted for testing ships' radio installations.

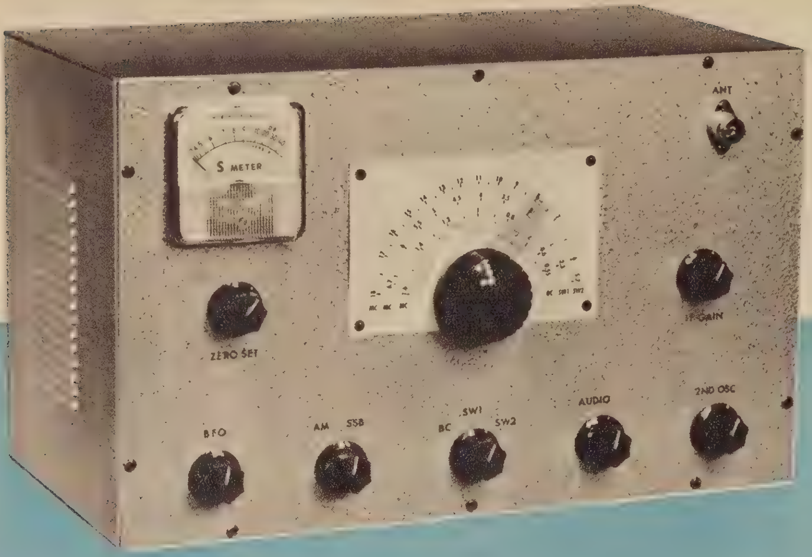
ORYX
World-famous miniature Soldering Instruments



NO SWITCH NECESSARY WITH ORYX —
The element is rated for continuous running, thus avoiding switch troubles and warming-up delays.

Weighs less than 1 oz. yet does the work of heavy irons. Long-life element and replaceable bits ensure years of service. There's an ORYX designed to meet your precise requirements.

Australian Distributors
MANUFACTURERS SPECIAL PRODUCTS PTY. LTD.
47 York St., Sydney. 2 0233, Ext. 279.
M.488



By
Keith
Woodward

The lower controls, from left to right, are BFO, AM/SSB, Bandswitch, Audio gain, 2nd Oscillator. The zero set for the meter is immediately below the meter.

A 3-BAND DOUBLE-CHANGE RECEIVER

The receiver described in this article was developed to meet the need for an economical unit which was one step above the simple dual-wave receiver yet not as complex as a full communications receiver. The tuning ranges include the broadcast band and frequencies between 2.3MC and 18MC.

Using readers' letters as a guide, careful consideration was given as to the features which should be included in this receiver. While numerous functions were requested, many of these could not be economically provided in the receiver, without the high order of complexity and cost we were trying to avoid.

In the majority of letters the coverage requested was firstly the broadcast band, followed by commercial broadcasting frequencies, then amateur band frequencies, followed by marine band frequencies. Most of these have been catered for in the tuning range mentioned above.

A few of our readers pointed out that they were not in the position to erect large antennas and would require a fairly high-gain receiver to compensate for the inefficiency of the antenna system. This order of sensitivity, together with sufficient selectivity for station separation on crowded short-wave bands, was regarded as a "must" in this receiver.

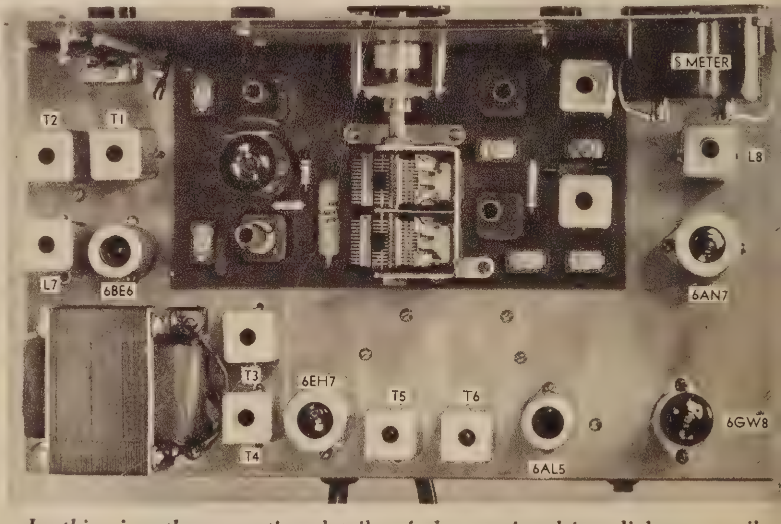
Also, on the short-wave bands, the problem of image rejection had to be considered. Finally, as single sideband suppressed carrier (SSB) transmissions are becoming more popular, we felt it necessary to provide for reception of these as effectively as possible. Such provision automatically covers the reception of CW signals, which may appeal to readers wishing to obtain Morse code practice.

Having settled the basic requirements, the next point to consider was the best method of achieving these results.

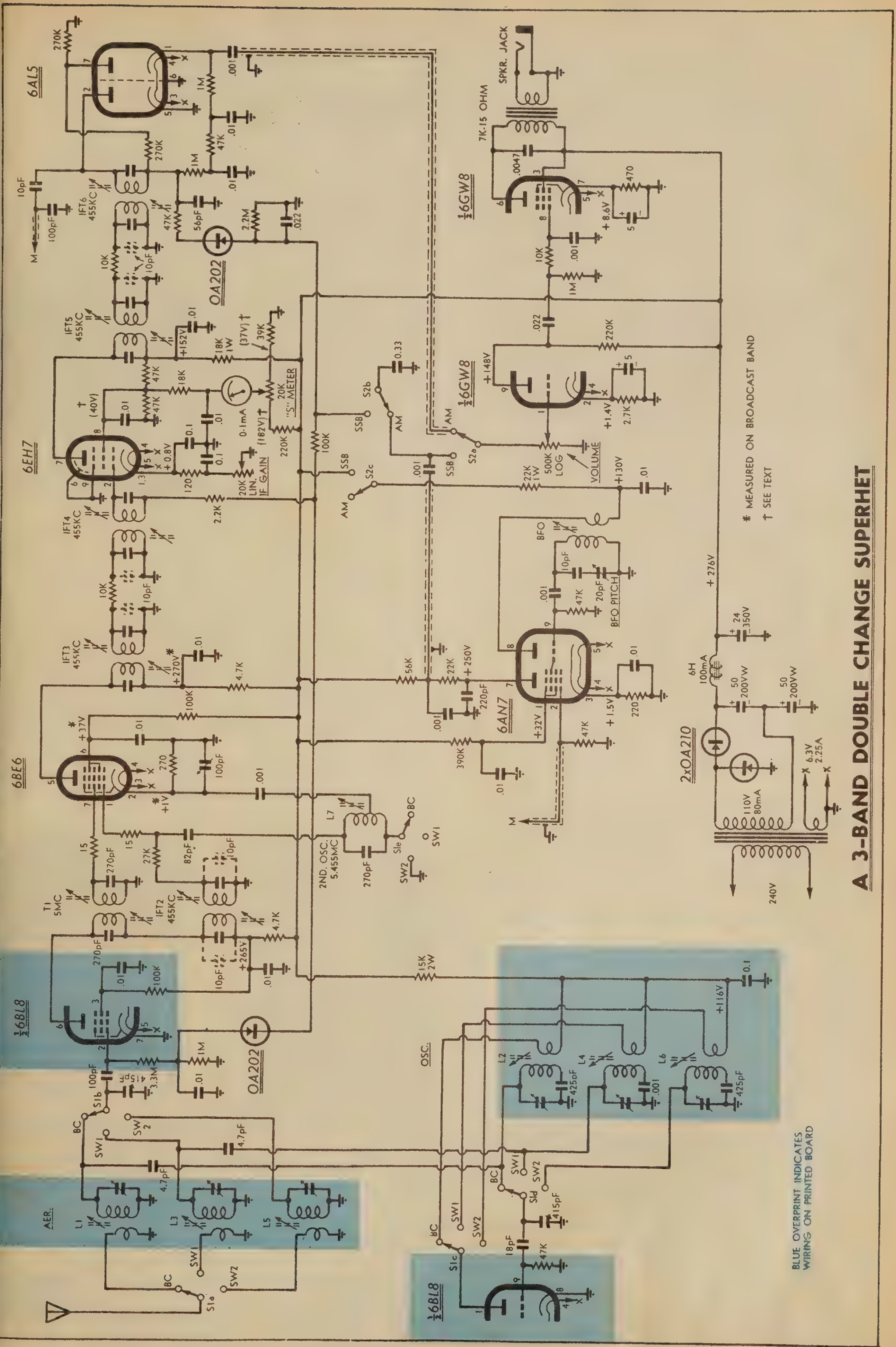
Beginning at the front end, there are two possible approaches to the selection of tuning ranges, namely plug-in coils or switched coils. Plug-in coils have the advantage of wiring simplicity, along with ease of adjustment to the coils to meet the tuning requirements. However, the system does tend to detract from the appearance and simple operation of the receiver, while the possibility of coil damage or loss is always present.

A bandswitched front end gives quick band changing without risk of damag to coils, thus ensuring stable dial cal bration. One disadvantage in Austral at present is the lack of suitable co assemblies, prewired and ready f operation. In this receiver we hav sought to overcome the problem b using a printed wiring board for th front end of the receiver. The coils a wound on readily available forme which mount on this board, along wi other components for the tuned stage

If demand warrants it, the manufa turer of these formers (RCS Radio Pt Ltd.) may supply prewound coils f the short-wave bands, as well as th standard broadcast coils used in ou proto-type. Broadcast band coils are als available from other manufacture who may also offer short-wave coils



In this view the mounting details of the vernier drive dial may easily be seen. The various components on the main portion of the chassis have been labelled for clear identification.

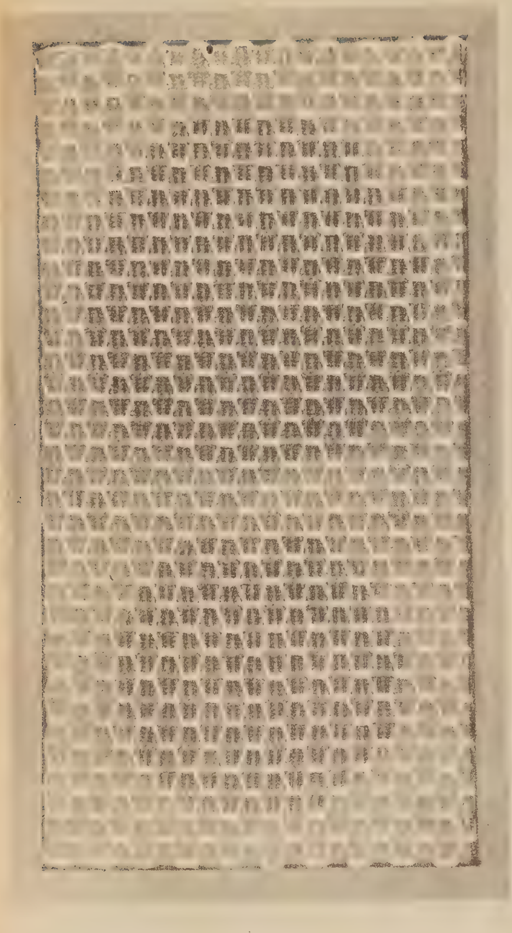

6AL5
270K
1M
47K
.01
.001
10pF
100pF
M
IFT6 455KC
56pF
2.2M
.022
OA202
10K
10pF
IFT5 455KC
+152V
18K 1W
[37V]†
39K
(40V)†
18K
0-1mA
20K "S" METER
(182V)†
220K
100K
SSB
AM
S2b
0.33
S2c
S2a
6EH7
+0.8V
0.1
120
20K LIN. IF GAIN
2.2K
IFT4 455KC
IFT3 455KC
+270V*
4.7K
6BE6
+37V*
+1V*
270
100pF
15
27K
82pF
T1 5MC
270pF
IFT2 455KC
+265V
L7
2ND. OSC. 5.455MC
BC
SW1
SW2
S1e
½6BL8
3.3M
15pF
S1b
OA202
15K 2W
0.1
+116V
OSC.
L2
L4
L6
425pF
AER.
L1
L3
L5
4.7pF
S1a
S1c
S1d
18pF
SPKR. JACK
7K-15 OHM
.0047
½6GW8
+8.6V
470
5
+148V
2.7K
+1.4V
500K LOG VOLUME
22K 1W
+130V
BFO
BFO PITCH
20pF
6AN7
+250V
56K
22K
220pF
390K
+32V
+1.5V
220
+276V
24 350V
6H 100mA
50 200VW
2xOA210
110V 80mA
6.3V 2.25A
240V

* MEASURED ON BROADCAST BAND

† SEE TEXT

BLUE OVERPRINT INDICATES WIRING ON PRINTED BOARD

A 3-BAND DOUBLE CHANGE SUPERHET



ABOVE ILLUSTRATED SPEAKER BOX IS HALF ACTUAL SIZE

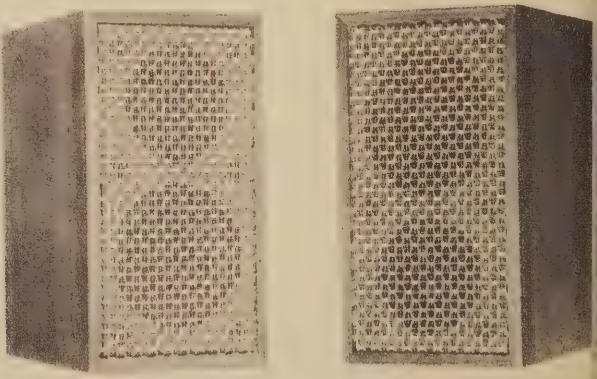
PEAK

Miniature Speaker Systems

The BX-400 and the BX-235S are two specially designed and manufactured speaker systems, which for their size (that's right, photograph on the left is half actual size) provide you with outstanding clear and crisp reproduction.
Choose either unit according to your own requirements.

SPECIFICATIONS

MODEL	BX-400	BX-235S
Max. Power — watts	20	10
Voice Coil Impedance	8 ohms	8 ohms
Resonant Frequency — c/s	90 ± 20	120 ± 20
Sensitivity	93 db	93 db
Flux Density — Gauss		
Woofer	10,500	9,800
Tweeter	8,000	8,000
Frequency Response — c/s	100 to 18,000	130 to 18,000
Net weight	6.5 lbs.	4.5 lbs.
Size	H (10") x W (5.5") x D (7")	
Finish	Oiled Walnut	

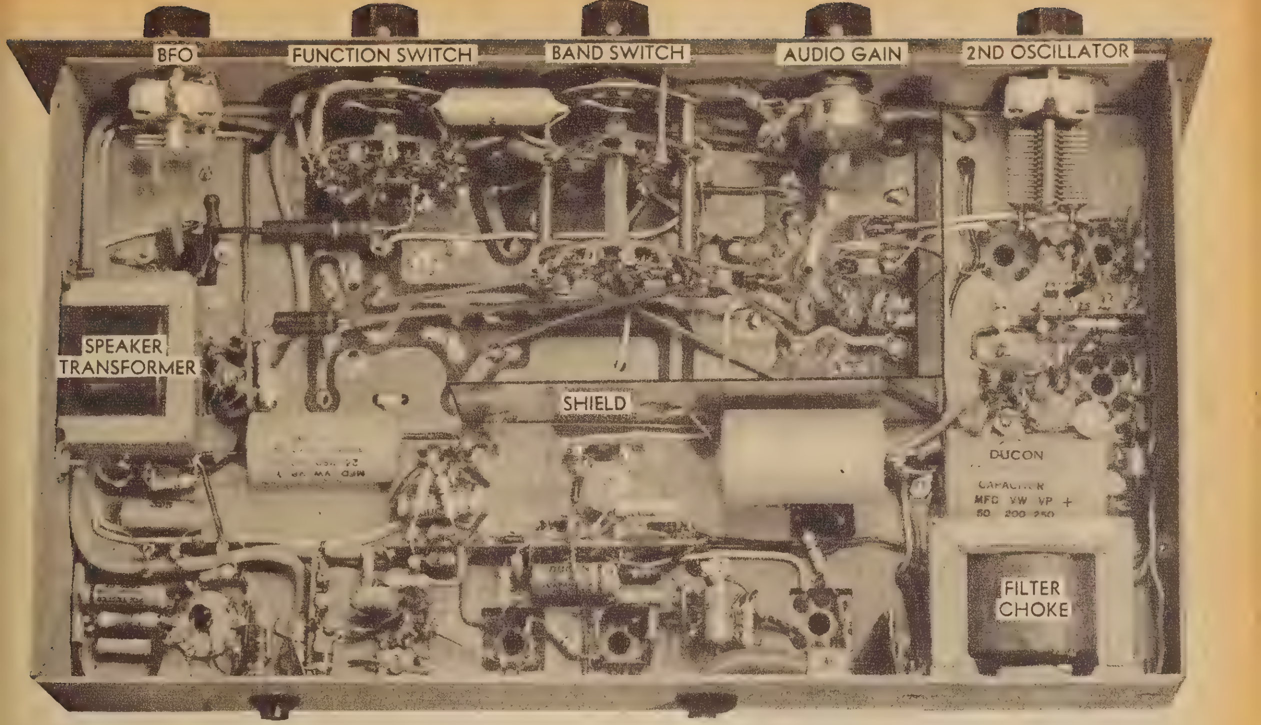


For their design, performance and finish, you think they should cost much more, but for nice surprise just ask for their prices.

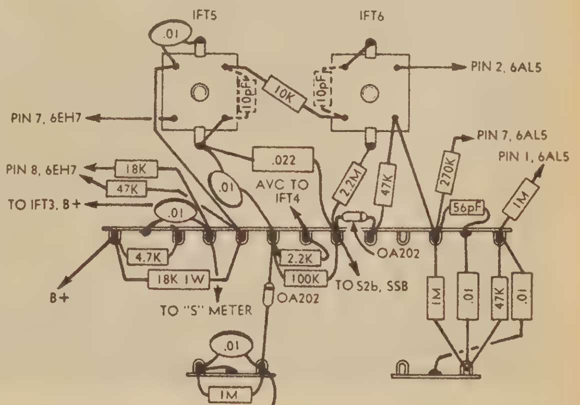
AVAILABLE FROM YOUR RETAILER,
SOLE AUSTRALIAN AGENTS

H. ROW
& CO. PTY. L

PK 3 P93



This underneath view shows the shield around the printed wiring board. This shield prevents feedback from the IF amplifier to the converter stage. The filter choke and rectifier diodes are mounted in one corner underneath the power transformer.



This wiring diagram shows the connections to the main tag-strip used in the receiver. Most of the components of the ANL, AVC and IF decoupling are mounted on this strip.

formers to suit. These coils would need to have the same pin connections as the original to suit the printed wiring board.

The printed board approach greatly simplifies the wiring of the initial stage of the receiver and it may be tackled with confidence by the relative beginner.

The question of gain, selectivity and image rejection are interwoven with the selection of the intermediate frequency. If an IF of 455KC is used, little difficulty is involved in obtaining gain and selectivity, but very serious problems arise at the higher signal frequencies with lack of image rejection.

Image problems can be alleviated by the use of additional tuned circuits, with or without an RF amplifier, at the signal frequencies. While this is a fairly common practice, it does mean more coils to be wound, more switching to be incorporated and more possible problems with front-end tracking and stability.

The use of a higher intermediate frequency tends to reduce image problems but also reduces the available selectivity.

A third method of attacking the problem is to use the double conversion principle where a high first intermediate frequency is used to reduce image response, followed by a low IF to achieve selectivity.

Unfortunately, the double conversion systems present their own problems in a general coverage receiver, one being a region of instability where the front end tunes across the first intermediate frequency. Again, the oscillator used for the second conversion tends to radiate harmonics which appear as unmodulated carriers in the tuning range of the receiver. To obviate this it is necessary to shield and filter the oscillator to a degree which is hard to satisfy in a home-builder project.

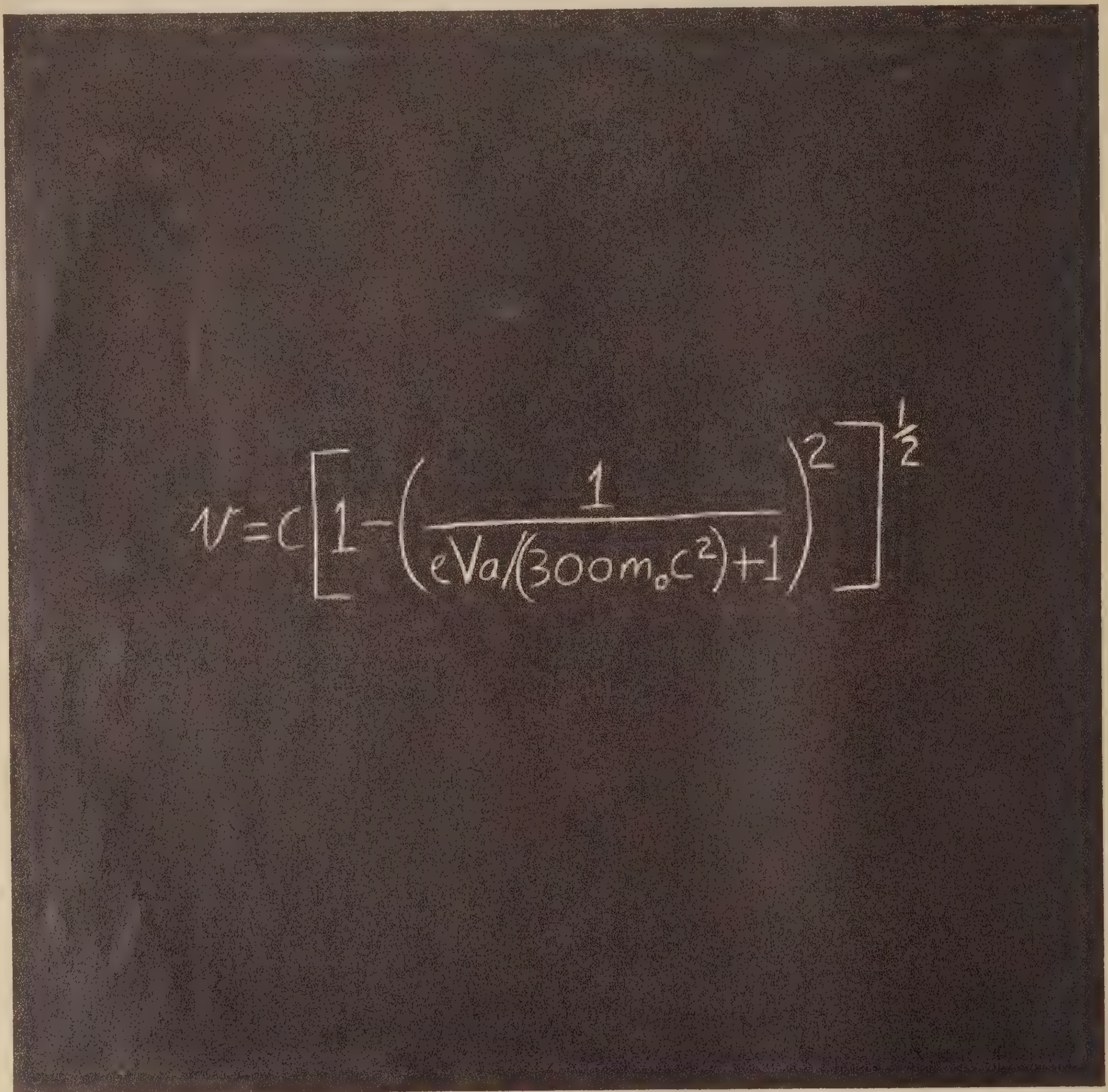
Since we have already decided that additional complexity of an RF stage could not be tolerated, it seemed to leave only the choice of a high IF with low selectivity, or double conversion with oscillator harmonic problems. However, we finally hit on a compromise, which allows us to retain most of the advantages of both systems.

Image rejection is no problem on the broadcast band, and only a minor one on the adjacent shortwave bands. We, therefore, decided to use a 455KC IF, with single conversion, for the broadcast and first shortwave band, resorting to double conversion for the second shortwave band only. By selecting a high first IF, it was hoped to minimise the number of oscillator harmonics which would fall in the tuning range. A figure of 5MC was selected, the conversion oscillator being set on the high side at 5.455MC.

With this arrangement the number of spurious beats was not great, but still left a little to be desired in that an oscillator harmonic could obliterate any wanted station. This problem was alleviated by making provision to shift the conversion oscillator over a range of approximately 5KC. As the harmonics move at a higher rate than the fundamental, and hence the signal being tuned, it is readily possible to shift the interfering signal to one side and retune the desired signal.

For example if the third harmonic of the oscillator is causing interference, shifting the fundamental by 5KC will shift the harmonic by 15KC, while changing the wanted signal by 5KC. It is thus only necessary to retune the main dial by 5KC to get interference-free reception.

The front end of the receiver therefore consists of a 6BL8 converter with output on the first two bands at 455KC and on the third band at 5MC. The plate circuit of this valve feeds into two IF transformer primaries connected in



$$v=c\left[1-\left(\frac{1}{eVa/(300m_0c^2)+1}\right)^2\right]^{\frac{1}{2}}$$

?

Most people go happily through life without ever needing to solve an equation from the time they leave school. But in the vastly complicated world of electronics, such equations are indispensable for reducing complex problems to simple terms. An example is the equation illustrated above. This equation provides the velocity which an electron will attain in its travel through a picture tube electron gun. It is interesting to note that, with a nominal anode voltage of 16,000 volts, the velocity of the electron will be approximately 170,000,000 miles per hour which is one quarter of the speed of light.

This is only one example of the complexity, and of the high demands placed on skill in the electronics industry today. This skill is passed on to you in the manufacture of our valves, transistors and picture tubes and is your guarantee for quality and reliability.

AMALGAMATED WIRELESS VALVE CO. PTY. LTD.
SYDNEY • MELBOURNE • BRISBANE • ADELAIDE • PERTH • HOBART

series, to eliminate the need for switching at this point in the circuit.

The following valve is a 6BE6, which acts as an IF amplifier at 455KC or a converter from 5MC to 455KC, depending on the band selected. On the second shortwave band an L/C oscillator is switched into circuit to activate the conversion oscillator. A 100pF variable capacitor is wired from the cathode of the 6BE6 to chassis. This capacitor is situated on the front panel and becomes the "spot shifter" on the second shortwave band.

To ensure adequate selectivity on all bands, especially the highest frequency band, we used back-to-back transformers in the IF line. These IFs are coupled by resistors rather than the more usual capacitors. This type of coupling gives good isolation between transformers and allows the transformers to be peak aligned using a signal generator without distortion of shape factor. When capacitor coupling was tried between the IF transformers, it required special alignment techniques to achieve a shape factor anywhere near that achieved with resistance coupling and peak alignment.

A high-gain IF amplifier, a 6EH7, is used in the next stage to compensate for losses due to the additional IF transformers and conversion stage. This is followed by a 6AL5 AM detector and automatic noise limiter. The noise limiter is a well known series type with one slight modification, namely the addition of a 47K resistor and .01uF capacitor between the two 1.0 megohm resistors.

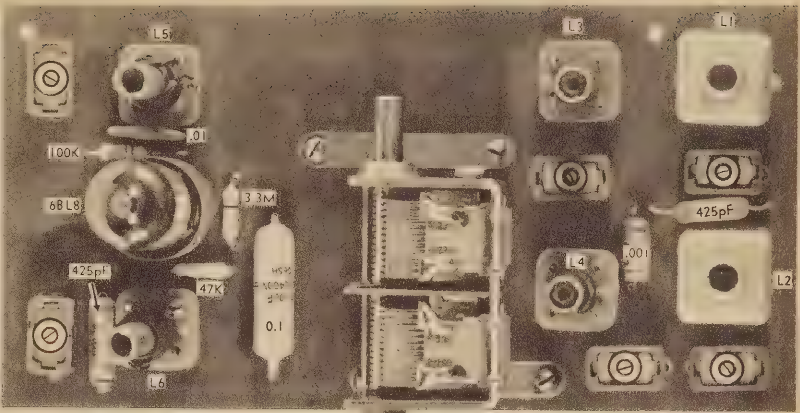
The second diode, pins 1 and 7, of the 6AL5 is a series noise gate which operates in the following manner: The components forming the detector load, two 270K resistors and a 56pF capacitor, have a relatively short time constant, allowing the voltages applied to pin 7 of the second diode to vary at a fast audio rate. However, the time constant of the line to the cathode, pin 1, has a long time constant produced by the 1 megohm resistor and .01uF capacitor.

The plate of the noise limiter diode is tapped down the detector diode load and is, therefore, maintained at a DC potential approximately half that of the cathode. With a modulated signal up to 100 per cent this potential difference allows the noise limiter diode to conduct, passing the audio on to the audio amplifier. However, if a noise pulse or modulated signal exceeds 100 per cent modulation in the positive direction, the limiter diode ceases to conduct, clipping the signal at the 100 per cent level, or thereabouts.

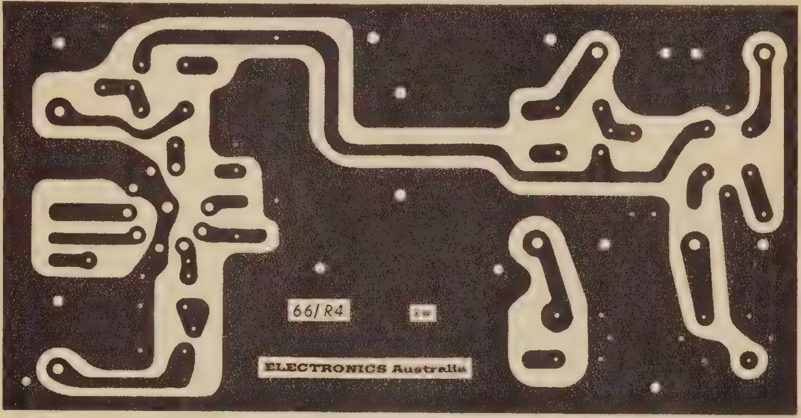
The audio output from the cathode of the noise limiter is wired to a selector switch in the audio amplifier input. In the normal series limiter configuration the two 1.0 megohm resistors are joined together and bypassed with one .01uF capacitor at their junction. We added a little extra filtering to this line in our receiver to reduce audio feedthrough.

Another possible source of noise plus audio feedthrough is output from the product detector leaking through the switch capacitance. This has been eliminated in this circuit by arranging the mode switch in such a manner to shunt output from the product detector to chassis when the switch is in the AM position.

As high impedance circuits are used in the noise limiter circuit, it is necessary to be careful when laying out the wiring and components so that the feed through will not be re-introduced by poor lay-out. The layout used in the prototype is shown in diagram and we suggest that this could be followed.



The components mounted on the printed wiring board are identified in the above view. The trimmers are mounted close to their respective coils. A reproduction of the printed wiring board is given below.



Some improvement in the performance of the noise limiting action may be obtained by the insertion of a series resistor in the heater supply to the 6AL5 valve. The value of this resistor should be approximately 10 ohms and rated at 1 watt.

For maximum efficiency in the reception of CW and SSB, a product detector is used. A product detector is one in which the incoming signal and that from a BFO, set to the nominal intermediate frequency, are mixed together similar in fashion to the synchrodyne type of detector. In the output of the mixer will appear, (unless a balanced mixer is used), the original high-frequency signals plus a third signal which is the product, or difference, of the original signals. This third signal will be in the audio range and is a reproduction of the original modulation of the transmitted signal.

We selected a 6AN7 valve for the

ACOS MICROPHONES AND MICROPHONE INSERTS

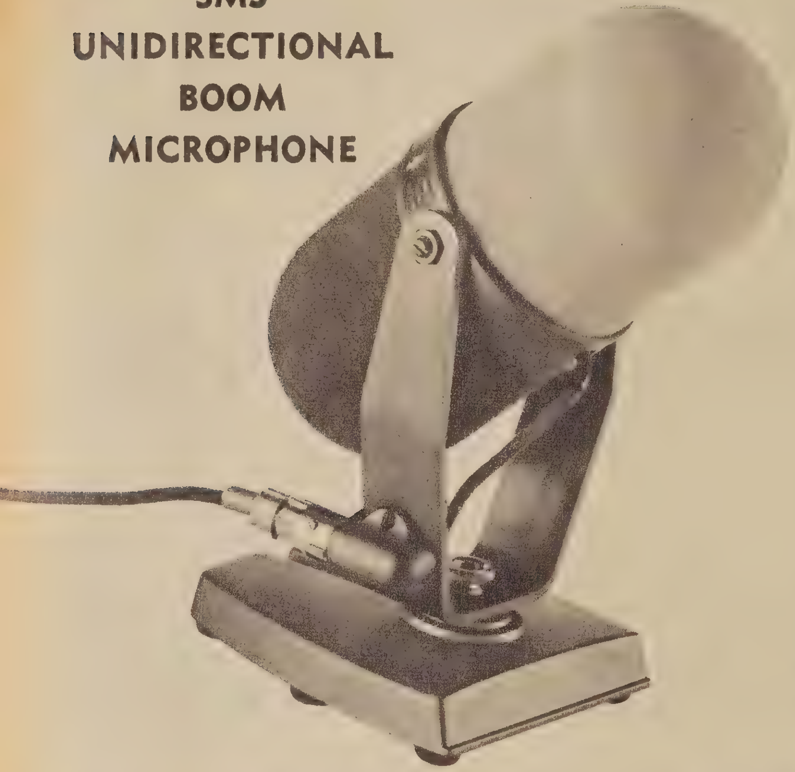
MIC 40 CRYSTAL. A sensitive crystal hand or desk microphone.
IDEAL FOR TAPE RECORDERS.
Frequency response .... 30-6,000 c/s.
Sensitivity .... —50 dB ref. 1 V/dyne/cm. 2.
Recommended load ...... 4.7 M Ohm for above response.
Price: £3/19/6.
MIC 40 CERAMIC. A tropicalised version of the MIC 40 with a ceramic element.
Frequency response .... 30-6,000 c/s.
Sensitivity .... —62 dB ref. 1 V/dyne/cm. 2.
Recommended load .... 4.7 M Ohm for above response.
Price: £4/19/6.
MIC 43 INSERT. This insert is fitted to MIC 40 and is available separately. Price: £2/15/6.

Sole Australian Agents:
AMPLION (A'SIA) PTY. LTD. 29 Majors Bay Rd., Concord, Sydney, N.S.W. Phone 73 1227
Victorian Distributors:
E. W. Cornelius Pty. Ltd., 5 Northumberland Street, South Melbourne, VICTORIA

SHURE

THE GREATEST NAME
IN MICROPHONES

SM5
UNIDIRECTIONAL
BOOM
MICROPHONE



Provides a new degree of reproduction quali and flexibility of operation in television and motio picture studio and location work.

(1) Minimises sound coloration due to off axis pic up—reverberation, reflection from floor or scenery Effectively rejects background noise. May be use in extreme hum fields.

(2) Frequency response—wide range, especiall tailored to provide natural dialogues or voc music pick-up with good presence, yet also suitabl for scoring.

(3) Integral wind screen most effective outdoo and for fast boom swings.

(4) Ruggedness and dependability—under all ope ating conditions——Element and isolation assembl fully protected.

The SM5, because of unusual mechanical co struction, may be used in many applications suc as outdoor sports and difficult remote pick-up

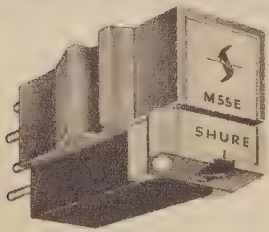
Guaranteed to operate perfectly for two years fro date of purchase.

$272 plus Sales Tax.

The Shure Professional Products Manual is available to Television Broadcasting and Recording Studios on request.

SHURE

THE GREATEST NAME
IN PHONO-CARTRIDGES



M55E
15° TRACKING
ELLIPTICAL
STYLUS

Compares favorably to the incomparable Shure V-15, except that it is produced under standard Shure quality control and manufacturing techniques. Remarkable freedom from IM, Harmonic and tracing distortion. Will definitely and audibly improve the sound of monaural as well as stereo records. A special value at $48.90. Upgrade M44 cartridge (if you can track 1½ grams or less) with N55E Stylus, $28.00

M44G
ECONOMICAL
TREND SETTE

The Shure M44G cartridge has been specially designed complement the 15 degree effective cutting angle n being used in newest recordings. It also serves to sign cantly improve the sound obtained from older discs. It v play stereo discs stereophonically, monaural discs mon ally, and stereo discs monaurally, without excessive w and distortion. The M44G utilizes the moving mag principal and features high needle compliance, low nee talk, low tracking force and wide range frequency respon Retail price $26.00

AUDIO ENGINEERS PTY. LTD.
NATIONAL DISTRIBUTORS FOR SHURE BROS.

342 Kent Street, Sydney. 29-6731.
60 Berwick Street, The Valley,
Brisbane. 51-5335.

product detector as it gives good isolation between the signal grid and the injection grid. This is a desirable characteristic in a product detector as it minimises the risk of the BFO signal being fed back and rectified by the diode detector, appearing as a bias on the AVC line. It is absolutely necessary to use the filtering resistor and capacitors in the output plate circuit to remove all trace of the IF and BFO components.

In most simple receivers the AVC is rendered inoperative during SSB reception but, by ensuring that the BFO energy does not produce a significant standing bias, we are able to make good use of the AVC in our receiver when receiving CW and SSB.

In the AVC system used, negative voltage from the detector diode is fed through an isolating resistor and gating diode to the AVC line. In AM operation the time constant is mainly set by the .022uF capacitor and 2.2megohm resistor. This system gives a relatively fast attack and medium decay. When SSB or CW operation is selected an additional .33uF capacitor is switched across the .022uF capacitor giving a much slower discharge rate. Thus the AVC control voltage tends to level out at a constant value during an SSB or CW transmission. The main purpose of the gating diode is to stop the AVC storage capacitors from discharging via the detector load resistors.

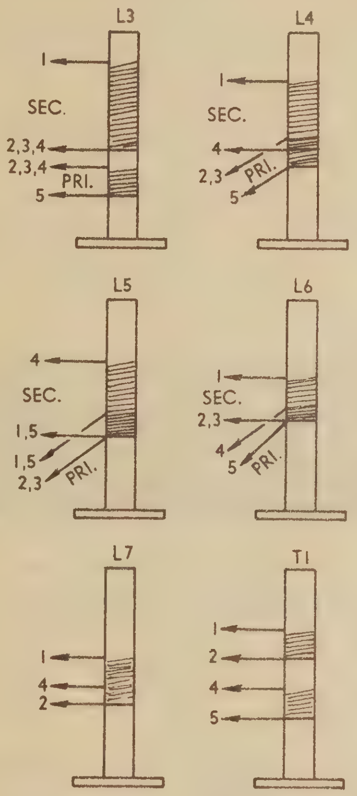
Another unusual feature in the AVC line is the inclusion of a diode in series with the AVC line to the 6BL8 converter valve. It is possible, in some circumstances, for a negative voltage to be developed at the converter grid, due to oscillator injection, which is in excess of that on the AVC line. Inclusion of this diode prevents the negative voltage from being fed into the AVC line, thereby reducing the sensitivity of the receiver.

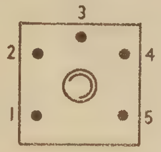
Frequency response of the audio amplifier used in the receiver has been "tailored" somewhat, both the low and high frequencies having been gradually rolled off. This roll-off helps reduce the random noise output when listening to weak signals and improves intelligibility of signals without adversely affecting voice reproduction.

The S-meter circuit follows normal configuration for a forward-reading function but operating from the screen rather than the plate supply. When AVC voltage is applied to the grid of the 6EH7 IF amplifier, the valve draws less current and the screen voltage rises. Thus, if a voltmeter were placed from the screen to chassis, the reading would rise from a certain level without signal to higher values as the input signal increased the AVC voltage.

Going one step further, if the original voltage reading were suppressed, so the meter read zero with no signal, we would have a forward-reading signal strength meter.

This has been achieved in the present circuit by applying a positive voltage to the negative terminal of the meter, which is equal to the screen grid voltage when no signal is applied to the re-





FORMER BASE DIAGRAM

L1 Miniature broadcast aerial coil.
L2 Miniature broadcast oscillator coil.
L3 55 turns, 31 SWG enamelled copper wire, closewound for secondary; 18 turns, 31 SWG enamelled copper wire, closewound and spaced ⅛in from secondary.
L4 46 turns, 31 SWG enamelled copper wire, closewound for secondary and insulated with plastic tape. Primary coil 20 turns, 31 SWG enamelled copper wire, closewound 10 turns over bottom end of secondary and 10 turns underneath secondary. Padder capacitor .001uF.

L5 18½ turns, 22 SWG enamelled copper wire, closewound for secondary; Insulate secondary with plastic tape and add primary over bottom end of the winding. Primary consists of 6 turns of 22 SWG enamelled copper wire close wound.
L6 Similar to L5, secondary 10½ turns and primary 3½ turns. Padder 425pF.
L7 19 turns, 31 SWG enamelled copper wire, closewound with tap 6½ turns from earth end. Tuning capacitor 270pF.
T1 Two windings consisting of 18½ turns, 31 SWG enamelled copper wire, windings spaced ¼in apart and tuned with 270pF capacitors.

All coils and transformers wound on plastic formers approximately 7MM in diameter. All coils wound in same direction.

NOW... PRINTED CIRCUITS TO YOUR OWN DESIGN!

Do you design your own circuits? All the advantages of printed circuits can be yours at modest cost. For many years Precision Windings have supplied printed circuits to Australian industry . . . and now streamlining of production techniques permits the economical manufacture of small quantities . . . even single circuit boards. You design and supply the artwork . . . we do the rest. Precision workmanship is guaranteed and delivery made within 7 days.
FREE!! As many enthusiasts will not be familiar with the preparation of "artwork", send a stamped, addressed envelope to us and we will forward a set of notes written to simplify preparation of "artwork". Instructions are clear and concise.

POST THIS COUPON NOW!

Please manufacture for me the printed circuits specified herewith in accordance with the artwork supplied.

Number required.. .. Scale of artwork... ..
Size. . . . . . Area.. . . . . D/N. . . . .
Phenolic paper circuits @ 5c per sq. in. $
Epoxy paper circuits @ 8c per sq. in $
Epoxy glass circuits @ 10c per sq. in $
Holes drilled @ 5 for 1c (.2c ea.) $
Cost of photonegative (fixed cost) $3.00
Sales Tax (12½% or 25%) $
Packing and registered postage $0.50
Total $

Please find cheque/money order/postal notes for total of $..........c........ (All cheques and money orders should be made payable to Precision Windings.)

NAME (BLOCK LETTERS)
ADDRESS
STATE .... OCCUPATION

PRECISION WINDINGS
52 CAMBRO RD., CLAYTON, VIC. TEL. 546 7820

MAKE YOUR OWN FROM AN INSTROL KIT

We cater for all "Playmaster" designs from "ELECTRONICS Australia." Our kits contain ALL best quality components, precisely to specification.

INSTROL-PLAYMASTER
No. 106 Amp./Tuner

Kit of parts	$96.50
Built and tested	$117.30

No. 111 NEW PROGRAM SOURCE TUNER

Kit of parts	$39.00
Built and tested	553.00

NOo. 4 STEREO AMPLIFIER

Kit of parts	$73.00
Built and tested	$93.80

No. 108 STEREOGRAM

Kit of parts	$69.80
Built and tested	$90.50

No. 110 TAPE AMPLIFIER
Kit of parts only

Tape Amp Unit	$63.00
Adaptor Power Unit	$31.50
STEREO REC Power Amp	$57.00

TRANSISTORISED IGNITION
("R. TV & H." March, 1964)

Kit of parts	$32.85
Roto Coil 6v or 12v	$10.70

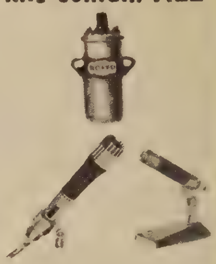
Postage 50c.

MICROPHONE CATALOGUE. Just printed — our new free michrophone catalogue and price list, detailing a wide range of various makes and models. The range includes types suitable for P.A. work, tape recording, stage work, etc. Send for your free copy.

CANNON CONNECTORS. Full range of these high quality audio connectors always available ex-stock. Detailed price list available.

INSTROL & OXFORD METALWORK. Detailed price list available for all instrol and Oxford metalwork and labels.

COMPONENT PARTS.
We carry a wide range of electronic components and can supply ex-stock, parts for most "ELECTRONICS Australia" (and "R. TV & H.") circuits. All best quality brands such as Ferguson, Ducon, Philips, Soldering irons by 'Scope, Robinson & Adcola, Hi-Stab, 1 per cent resistors, etc., etc. We will gladly quote if you send us a detailed list of your requirements.



POSITION VACANT

Excellent opportunity in our store for a young man 16 to 18. Must understand component parts and be reasonably familiar with "Electronics Australia" designs. Good handwriting and quick at figures essential. Phone for appointment.

BROADWAY ELECTRONICS PTY. LTD.

E.S. & A. BANK BUILDING, CNR. BROADWAY & CITY RD., SYDNEY
(Opp. Grace Bros.)
Phone: 211-4224, 211-4244, 211-4213

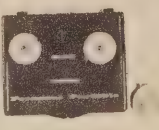
NEW IMPROVED 30 WATT

12v. All Transistor P.A. AMPLIFIER

No. 598—Complete Kit of parts to smallest screw, $55. No. 656 — Wired ready to operate,$60. Freight extra. Size: 6in w. x 3in h. x 8¼in d. Weight 6½lb.

PERSONAL PORTABLE

2 TRANSISTORS



Range 30 miles, 200 with short aerial and earth. Earpiece only, no speaker. Wired ready to use, No. 666D, $10.
Postage 20c.
Do-it-yourself kit, No. 666C, on app.

COILS & IF's 455 Kc

Aer, R.F. osc. and IF's . ..	$1.70 ea.
Ferrite Aer	$2.

Postage 10c. Write for details and price
Part 265 Universal Tape OSC coil, $6.

PRE AMPLIFIER
6 transistor
2 (silicon)

For 5 watt amplifier with panel and knobs, Stereo do-it-yourself kit No. 616C, $25.80. Postage, 20c. Mono, do-it-yourself kit No. 616AC, $15 Postage 10c.

Write for data sheets.

Printed circuit mono, or stereo No. 616 .. .. $3
Postage 10c each.

5 watt stereo power supply. Do-it-yourself kit No 681C, $16 Printed circuit No. 681, $2.50. Postage 681C, 80c; 681 10c.

PRINTED CIRCUITS

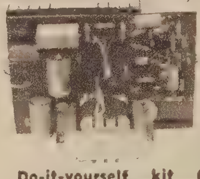
From your drawings. Price: $10 set up charge plus 30c for each print 5 sq. in. and under. For prints over 5 sq. in., add 2c per sq. in Drilling, plating, coding, price on application

NEW!
LOW PRICE!
QUALITY CONSTRUCTION!
PEAK RECEPTION!

R.C.S. COMPLETE DO IT YOURSELF KITS

● No expensive test equipment ● Everything fits.

1964 RF Transporta 7. Complete kit—No. 640: $43.50. Portable car radio, identical to 640 above, plus extra switch and car coil, etc. No.642:$46.
(Write for booklet on 640 and 642.)



3 TRANSISTORS
HI-FI MULLARD FIVE WATT AMPLIFIER

Frequency response—30 cycles to 18 KC, 3 DB. Distortion — one half of one per cent or better. Input—125 MV, 1,000 ohms impedance. DC supply—22 volts 0.8 amps, speaker 15 ohms. Size: 5¾in long x 4in high x 3in deep.

Do-it-yourself kit 675C $17. Postage 30c.
Write for blueprint data.

IMPROVED BATTERY SAVER KIT

$4\frac{1}{2}$, 6 or 9 volts. Replaces transistor battery power input 240 volts A.C. Maximum milliamps 100. Hum-free operation Size 3½in l. x 2½in w. x 1½in h. No. 657, $6.50 (post 10c).

R.C.S. PERSONAL TRANSISTOR

1 Transistor,
1 Diode.

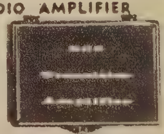
No. 582—Do-It-Yourself Kit of Parts for above, $5.
No. 593—Wired ready to operate. $6.
Postage 582, 593 10c. No C.O.D.s.

NEW PRINTED CIRCUITS

Part No.		
675	HI-FI FIVE WATT amplifier	$2.50
684	Preamp.—Electronics 65/P12A	$2.50
684	Preamp. Electronics 65 P.10 .	$2.50
686	Preamp.—Electronics 65/P12B	$2.50
687	Preamp.—front panel 65/P12	$2.50
689	Philips pre-amp.	$3.00
690	Philips 10-watt amp.	$2.50
691	Philips 10-watt power supply	$2.50
692	E.A. 8-watt stereo 63 A4 ..	$3.00
580	Car Radio	$3.50
591	30 W.P.A. Amplifier	$3.50
606	Mullard 10/10 Stereo, pr.	$6.50
608	Mullard WB Tuner	$3
669	R. and H. Tape Recorder	$3.20

Sales Tax included. Postage 10c. We can supply any R.H. Printed Circuits.

NEW AUDIO AMPLIFIER



4 transistors. ½ or 1 watt. Small size cabinet 3" x 2" x 1" plastic. Suitable crystal P.up. intercom., microphone radio etc (9 volt.
Do-it-yourself kit 665, $10 (Post 10c).
Wired ready for use, 665D; $11.50.

THREE NEW TRANSISTOR PREAMP KITS:

LOW IMP. input 2 trans. 672C	$6.50
Wired ready for use, 672D	$8
HIGH IMP. silicon 2 trans, 680C	$6.50
Wired ready for use. 680D	$8
HIGH IMP. silicon 3 tran. 682C	$7.50

SIZE 3 x 2 x 1in 2 req. for Stereo.
Wired ready for use. 682D $9
Postage 10c each. Write for data.

Order by Mail Order, Postal Note or Money Order (add post.), direct to—
R.C.S. RADIO PTY. LTD., 651 FOREST ROAD, BEXLEY, N.S.W. 58-3491, 58-5385.

ceiver. This voltage has been made adjustable so that the meter may be set exactly to zero with the receiver aerial terminal shorted to ground.

When the receiver is first switched on, the meter will read full scale and then settle back to a reading depending on the setting of the zero set control and any signal being received. Do not be alarmed at the meter reading full scale when the set is first switched on as this is normal and will not endanger the movement.

However, we suggest that the circuit conditions be checked before wiring the meter into circuit. Shown in brackets are typical voltages, measured with the meter disconnected and no signal applied to the receiver. If the voltages are substantially similar, the meter may be connected safely.

With the circuit constants shown our S-meter read S9 with approximately 250 microvolts applied to the aerial terminal. The lower S points averaged very close to 6dB steps thus giving quite a reliable signal strength indication. The S-meter used was made available by Deitron Electronics and similar meters should be available from many radio component distributors. The basic movement is 1mA and has an approximate DC resistance of 100 ohms.

To cover possible differences between movements or sensitivity of receivers, some adjustment of the S-meter circuitry may be required. To make the circuit less sensitive the 18K series resistor may be increased. If on the other hand it is wished to increase the sensitivity of the circuit, the resistor may be decreased in value. However the value should not be decreased below approximately 10K. If this seems necessary then it would be better to increase the voltage swing on the screen by using only a series dropping resistor rather than a voltage dividing network. This could be the 47K resistor already in series or a higher value.

A feature of the receiver is the dial used to drive the tuning capacitor. This is a new unit released by Watkin Wynn and incorporating a two-speed drive. For fast tuning a speed of 6:1 is available, but turning the dial in the opposite direction to that previously used automatically brings into action a 36:1 ratio. This double vernier feature is extremely handy when tuning short-wave stations.

Should the slower tuning rate be preferred for all tuning, this may be accomplished by removing a small button on the drive shaft immediately behind the dial knob. Once this is removed, however, it is nearly impossible to restore the two-speed feature.

This particular dial has a metal backing plate on which the drive mechanism is mounted. We found that this made the task of aligning the dial drive to the tuning capacitor extremely simple. All that is necessary is to remove the knob and cursor, together with plastic cover and cardboard sheets from the main mechanism, leaving assembled the backing plate and vernier drive. This section may now be mounted on the tuning capacitor shaft.

The next step is to cut a clearance hole of approximately ¾in in the front panel centred on the position of the dial drive shaft. This will allow the panel to be temporarily mounted with the drive shaft protruding through the centre. The backing plate may now be adjusted to sit flat against the rear of the front panel, the position of the tuning capacitor being adjusted, if necessary, to achieve this. Finally square the backing plate with the front panel and mark the dial mounting holes through the holes on the backing plate.

Remove the panel and drill the four holes as marked, then reassemble the chassis and front panel. The backing plate remains behind the front panel in the finished assembly and the cards, perspex cover and cursor are mounted on the front, the four mounting screws making a rigid assembly.

To give a balanced layout for the front panel, the tuning capacitor was lifted above the printed wiring board by four spacers 9/32in long.

A calibrated dial scale for this receiver will be available through the information service for a nominal sum of 50c. A blueprint of the receiver chassis and front panel will also be available for the same amount. While our front panel was lettered with a dry transfer process it is possible that metalwork, including etched front panel, may be released by our advertisers.

Constructors should not experience undue difficulty in copying the prototype receiver and a wiring diagram is given showing the layout of the main tagstrip. The printed circuit board will be made available from RCS Pty. Ltd. and possibly other advertisers. The coil formers used in the original were obtained from the same source, but any substitute

PARTS LIST

1 Standard Instrument Case (13 x 8 x 7 inches), complete with front panel and chassis.
1 Printed wiring board, 66/R2.
1 Voltage Doubler power transformer, 240VAC primary, 110VAC secondary and 6.3VAC. Output approx. 280VDC at 80mA.
1 6 henry 100mA filter choke.
1 7K to 15-ohm speaker transformer.
1 Bandswitch, 2 wafer, each wafer 3-pole 3-position (see text).
1 Function switch, 3-pole 2-position.
1 Variable capacitor 0-20pF.
1 Variable capacitor 0-100pF.
1 Roblan two gang capacitor, 415pF maximum capacitance.
1 .5 megohm potentiometer, audio taper.
2 20K potentiometers.
1 Two-speed Jabel log dial.
1 2½in square "S" meter, 1mA FSD.
1 Belling and Lee coaxial aerial connector.
5 Miniature 455KC IF transformers, RCS 119 or equivalent.
5 Miniature slug tuned coil formers with single slug.
1 Miniature slug tuned coil former with two slugs.
2 Shield cans for above formers.
1 Miniature broadcast aerial coil.
1 Miniature broadcast oscillator coil.
1 Miniature BFO coil (Aegis type M47A or similar).
2 7-pin ceramic valve sockets with shields.
3 9-pin ceramic valve sockets, 2 with shields.
1 9-pin mica filled valve socket, with shield, for printed wiring board.
6 Ducon 5-30pF compression trimmers.
1 Speaker jack and plug.
1 Three-core power cord and plug.
7 Small indicator knobs.

VALVES AND DIODES

2 OA210, 1N1763 or equivalent diodes.
2 OA202 or equivalent diodes.
1 6GW8.
1 6AN7.
1 6AL5.
1 6EH7.
1 6BE6.
1 6BL8.

TAGSTRIPS

1 13-lug tagstrip, lug 2 and 12 mounting.
3 5-lug tagstrip, centre mounting.
2 4-lug tagstrip, lug 2 mounting.
2 3-lug tagstrip, centre mounting.
1 2-lug tagstrip.

RESISTORS

(½ watt unless specified)

2 15 ohm.
1 120 ohm.
1 220 ohm.
1 270 ohm.
1 2.2K.
1 2.7K.
2 4.7K.
3 10K.
1 15K 2W.
1 18K.
1 18K 1W.
1 22K.
1 22K 1W.
1 27K.
1 39K.
7 47K.
1 56K.
1 100K.
2 220K.
2 270K.
1 390K.
1 470K.
4 1 megohm.
1 2.2 megohm.
1 3.3 megohm.

CAPACITORS

2 4.7pF NPO ceramic.
8 10pF NPO ceramic (see text).
1 18pF NPO ceramic.
1 56pF plastic, 400VW.
1 82pF plastic, 400VW.
2 100pF plastic, 400VW.
1 220pF plastic, 400VW.
3 270pF plastic, 125VW.
2 425pF silver mica.
5 1000pF plastic, 400VW.
1 1000pF plastic, 400VW, 5 p.c. tolerance if available.
1 .0047 plastic 400VW.
10 .01uF ceramic, 350VW.
2 .01uF plastic, 400VW.
2 .022uF plastic, 400VW.
2 .1uF plastic, 125VW.
1 .1uF plastic, 400VW.
2 5uF 25VW pigtail electrolytics.
1 24uF 350VW pigtail electrolytic.
2 50uF 200VW pigtail electrolytics.

MISCELLANEOUS

Grommet, screws, nuts, solder, hook-up wire, tinned copper wire, shielded wire, etc.

WIRELESS INSTITUTE OF AUSTRALIA
VICTORIAN DIVISION

A.O.C.P. CLASS

commences

MONDAY, 2nd MAY, 1966

Theory is held on Monday evenings, and Morse and Regulations on Thursday evenings from 8 to 10 p.m.

Persons desirous of being enrolled should communicate with:—

Secretary W.I.A., Victorian Division, P.O. Box 36, East Melbourne (phone 41-3535, 10 a.m. to 3 p.m.), or the Class Manager on either of the above evenings.

Built-in MW Stereo circuits bring you new simplicity and convenience in MW Stereo broadcast listening. There's RIAA compensated phono input for magnetic cartridge, plus inputs for crystal or ceramic cartridge and stereo tape recorder or other program source.

Model W-26 (24 WATTS)

● OUTPUT POWER :	24 Watts total Music Power, 12 Watts per channel (IHF Standard at 1% harmonic distortion)
● USABLE SENSITIVITY :	MW 1, 2; 10 microvolts 1000 kc SW; 30 microvolts 7Mc (Input required for S N 10 db)
● SPECIAL CIRCUITS :	Loudness Control, High Filter, Tape Monitor.
● DIMENSIONS :	Width 17-11 16″, Height 5-13 16″, Depth 14″.
● NET WEIGHT :	29 Lbs.

SOLID STATE INTEGRATED STEREO AMPLIFIER Model TK400E (80 WATTS)

Silicon Power Transistor

- OUTPUT: 80 Watts total music power (IHF Standard) or 40 Watts per channel. 32 Watts RMS power per channel.
- TRANSISTORS & DIODES: 21 Transistors, 2 Silicon diodes, 2 Germanium diodes
- DAMPING FACTOR: 20 0.3 per cent at 25 Watts (1000 cps) 1 per cent at 40 Watts (1000 cps).
- DIMENSIONS: Width 15¼ ins., Height 5¾ ins., Depth 12¼ ins.

MANUFACTURED BY TRIO CORPORATION
13 MITAKE-CHO, SHIBUYA-KU, TOKYO, JAPAN

TRIO
U. S. A. BRAND
KENWOOD®

the sound approach to quality

MW-MW-SW STEREO TUNER AMPLIFIER Model W-26 formers will require the same pin configuration if they are to fit the printed wiring board.

Details of the hand wound coils for the short-wave bands, the 5.0MC IF and the second oscillator are given in this article and should be followed closely if the best results are to be achieved. The same type of formers are used for all these coils except that the short-wave coils do not use shield cans.

The bandswitch used in our prototype was purchased as a three-wafer switch, each wafer being a three-pole three-position type. By removing one wafer and placing the spacing pieces between the remaining two wafers, we ended up with a wide spaced two-wafer switch. While it may not be essential to follow this course, it does make it much easier to wire, at very little additional cost, than using a standard two-wafer switch.

The shield shown around the two sides the tuning section is necessary to prevent the high level IF signal feeding back into the tuning section. Our shield was manufactured from tinplate and soldered to solder tags mounted around the tuning section. However, there is no reason why brass plate or aluminium cannot be used, as long as appropriate provision is made for mounting.

Do not forget to make provision at the bottom of this plate to feed the leads through to the tuning unit. These will be heater, earth, high tension and IF output at the side and AVC line at the rear.

Alignment of the receiver requires the use of a signal generator or modulated oscillator covering the IF and tuning range frequencies. With the set switched to the broadcast band, a 455KC signal may be applied to the converter grid circuit and all 455KC IF slugs peaked for maximum performance. Note that it will probably be necessary to add 10pF capacitors to the back-to-back IFs on the windings where the 10K resistor is used owing to the lack of normal capacitive circuit loading.

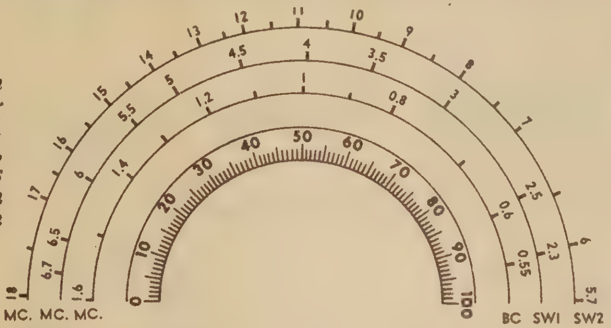
For the same reason, one or both windings on the first 455KC IF transformer may have to be loaded with 10pF capacitors. It is best to check that the peak found on each slug is the one with the slug wound well out, as it is possible sometimes to get a second peak with the slug wound well in. This second peak may be the result of the slug coupling the two windings together and possibly peaking the associated winding to frequency at the same time. This over-coupling will ruin the shape factor of the IF strip.

After the 455KC IFs have been aligned satisfactorily, switch off the modulation of the signal generator and switch the product detector on. Set the pitch control to the centre of its travel and adjust the slug of the BFO coil till zero beat is achieved. If the BFO pitch control is now turned either side of centre an audio beat should be heard.

Switch off the product detector, restore the signal generator modulation and set the generator to 5.0MC. Next switch the receiver to the second short-wave band and, with the spot shift capacitor plates fully meshed, run the slug into the second conversion coil till it gives peak output at 5.0MC. The 5.0MC IF slugs may now be peaked for maximum output.

This completes the IF alignment and the tuning coils may now be adjusted.

A reproduction of the receiver dial scale. A copy of this, correct size, is available through the information service.



The broadcast coils are aligned first, with the signal generator coupled to the aerial terminal. The oscillator slug should be adjusted to make the dial read correctly at 600KC, while the oscillator trimmer may be set for correct reading at 1500KC. Repeat these adjustments till reasonable tracking is achieved. The aerial coil may now be peaked in the same manner.

The first short-wave coils cover a frequency range of approximately 2.3MC to 6.7MC. The coils may be adjusted to match the dial calibrations at 2.3 MC and 6.5 MC. On the high end of the tuning range, during preliminary alignment, it may be necessary to sort out which is the required signal and which is the image. Two signals will be found 910KC apart; as the oscillator operates on the high side of the signal the lower frequency of these two signals is the correct one to use for alignment.

At the top end of the tuning range it may be found that the adjustment of the aerial trimmer will pull the oscillator frequency slightly. If this occurs, follow the signal with the signal generator, adjusting the aerial trimmer for maximum output and neglecting for the moment the upset of the dial calibration. After adjusting the aerial trimmer readjust the oscillator trimmer for correct dial calibration and repeat these adjustments until the maximum signal strength is achieved at the correct frequency calibration on the dial.

This alignment may sound involved but takes very little time once the job is started. The final short-wave coils may be aligned at 6.0MC and 17.0MC on the dial. No trouble should be encountered with images on this range as these are now separated by 10.0 megacycles. The oscillator coil operates on the high side of the signal and should therefore tune approximately 10.7 to 23MC.

When assembling the receiver a preliminary alignment may be made with the aid of a grid-dip oscillator if one is available. We also found the resonance meter recently described very useful in this regard. Even with the additional capacitance of this tester and the inductance of the short leads to the tuning capacitor we were able to set the coils very close to the final point.

With care in alignment this receiver should give a very good performance both in sensitivity and selectivity. For a receiver with a converter as the first stage it gives a very reasonable noise figure. Should some instability be encountered in the IF amplifier the value of the 2.2K resistor in the AVC line may be varied but normally should not exceed about 4.7K. If it does then there is probably a minor fault in the wiring or placement of parts in the IF strip. ■

Paton

32 Series MULTIMETERS

with Taut Band Suspension & Diode Overload Protection

RANGES:

A.C. & D.C. Volts to 1,000V. (12 Ranges)
D.C. Current to 10 Amp (9 Ranges)
Ohms to 10 Megohms (3 Ranges)
Decibel Ranges (6 Ranges)

MODEL 32A
D.C. 1,000 Ohms/Volt.
Special Price:
£13.17.6 ($27.75)

MODEL MX32
D.C. 20,000 Ohms/Volt
Price: £17.17.6 ($35.75)

MODEL MXL
D.C. 40,000 Ohms/Volt
Price: £19.17.6 ($39.75)

Life Service — Made in Australia (25 years' experience) and backed by Factory Service. Do not under-estimate this advantage.

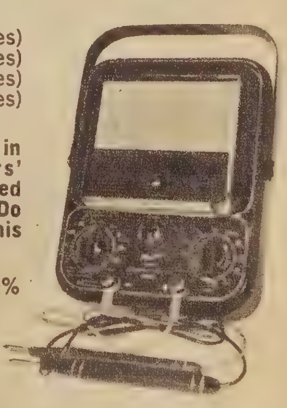
All prices plus 12½% Sales Tax.

TERMS AVAILABLE.

Send for full details

PATON ELECTRICAL PTY. LTD.

90-94 Victoria Street, ASHFIELD, N.S.W. 71 0381



Now sold by leading tape retailers throughout Australia at wholesale prices

BUY YOUR TAPE FOR LESS!

Fantastic offer!

DIRECT FROM U.S.A.

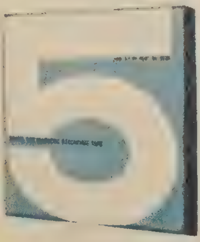
America's finest professional quality recording tapes at lower prices than you're paying.

Brand 5, acclaimed as the most popular brand of tape in the U.S.A., now available in Australia, take advantage of this offer . . . a recognised top-quality tape for £££'s less than its nearest competitor.

Look at these prices — compare them with other makes
THEN SAVE YOURSELF $$$'s

BRAND FIVE MAGNETIC RECORDING TAPE

6 big features of BRAND 5



☐ NEW, IMPROVED, EXCLUSIVE, DRY SYNTHETIC LUBRICANT. No squeal, no gumming of heads, vastly reduced head wear.

☐ NEW, HARDER, SCRATCH-RESISTANT FORMULATION. No flake-off, peeling or deposit on guides and heads.

☐ INCREASED OUTPUT. Reduced distortion at same recording level.

☐ IMPROVED FREQUENCY RESPONSE. Sharper, brighter recordings.

☐ IMPROVED UNIFORMITY. Lower modulation noise.

☐ NEW, STURDY, ONE-PIECE, QUICK-THREADING REEL OF MS-19X. Stable, warp-free operation.

'BRAND 5' tape is composed of a cellulose acetat plastic or Mylar polyester base, coated with high remanence iron oxide emulsion. All 'BRAND 5' tape have medium coercive force which means lastin positive recordings as well as perfect, noise-fre erasure. 'BRAND 5' tape can be used time and tim again without wear to tape or recorder.

Send for brochure and specifications:

GREEN CORPORATION LTD.
88 KING STREET, SYDNEY. PHONE: 25-1989

Name & Address ....

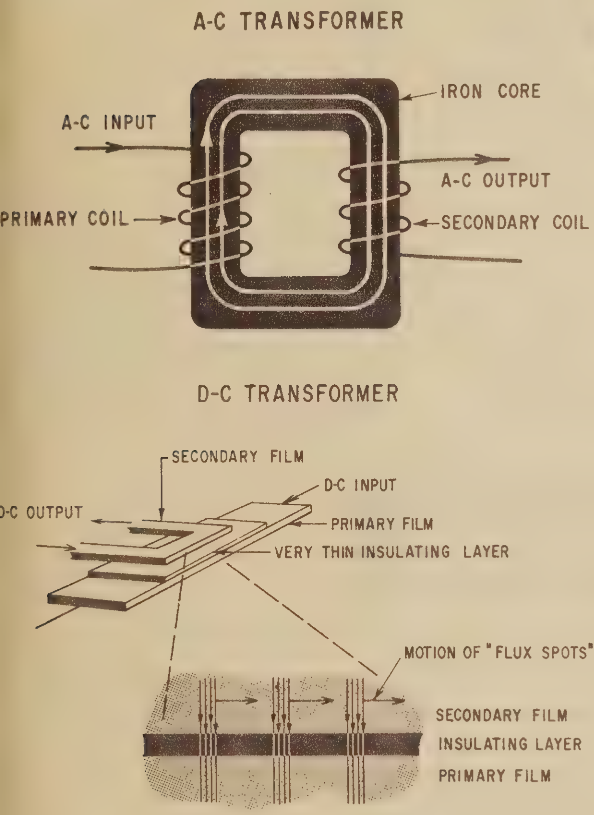
....

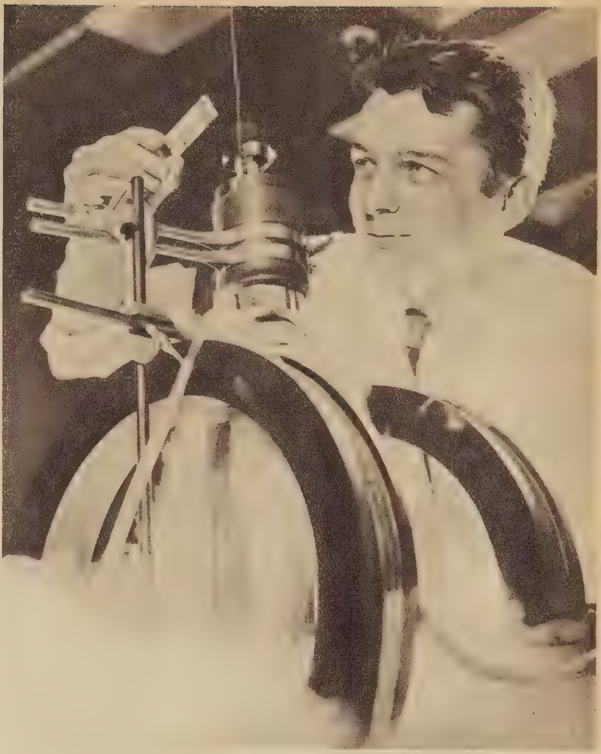
make of recorder ....

Breakthrough . . .

A DIRECT CURRENT [DC] TRANSFORMER

Working with extremely thin films of tin deposited on a glass slide, a General Electric scientist has built and operated a laboratory model of a direct current (D.C.) transformer—long considered an "unachievable" scientific goal.





A laboratory model of the direct current transformer is held by Dr. Ivar Giaever.

Left: In an ordinary AC transformer (top), the primary and secondary coils are wound from metal wire, such as copper. In the new DC transformer (bottom), the primary and the secondary are made from two thin films of tin. When the DC transformer is cooled to liquid helium temperatures and a direct current is fed into the primary, magnetic "flux spots" begin to move in one direction relative to the primary film. These flux spots also penetrate and move through the secondary film, which is only in the order of .000001 inch away. As a result of this moving (and hence changing) magnetic field, a direct current is induced in the secondary film.

Experimental model of General Electric's D C transformer consists basically of thin films deposited on a glass slide. The dark strips are the operating parts of the device, while the silvery strips serve as leads through which the input and output currents travel.

The device is a result of research on superconducting materials — metals and alloys that have zero electrical resistance and unique magnetic properties at very low temperatures, Dr Ivar Giaever reported at a recent meeting of the American Physical Society.

The General Electric physicist disclosed that his D.C. transformer — which can convert a direct current input into a larger or smaller direct current output — has been operated at very low voltages and currents, with an efficiency of about 10 per cent. Although no immediate commercial applications are foreseen for the D.C. transformer, the device marks the achievement of a goal that had eluded researchers ever since the alternating current transformer was first demonstrated nearly a century ago.

The conventional A.C. transformer has long been a familiar sight on electrical power poles and inside radios and television sets. Such A.C. transformers consist basically of two separate wire coils placed near one another. When an alternating current is passed through one coil (the primary), a changing magnetic field is produced — one in which the magnetic lines of force travel first in one direction and then in the opposite direction. This changing field induces an alternating current in the second coil (the secondary). These conventional A.C. transformers are unable to transform direct current — which, in materials with conventional magnetic properties, sets up an unchanging magnetic field.

In General Electric's new D.C. transformer, the primary and the secondary are made of thin tin films, which belong to a family of Type II superconductors. When an ordinary superconductor is placed in a magnetic field, the metal excludes the magnetic lines of force. Type II superconductors, on the other hand, can be penetrated by a magnetic field —

but only in so-called "flux spots."

When a direct current is passed through the tin primary, the magnetic flux spots begin to move in one direction relative to the film. In the D.C. transformer, these flux spots also penetrate and move through the adjacent secondary film. As a result of this moving (and hence changing) magnetic field, a direct current is induced in the secondary film.

The magnetic field fluctuations produced by the primary of the D.C. transformer exist only very close to the film. Thus, the secondary film must be placed no more than about .000001-inch away from the primary film. In Dr Giaever's experimental devices, the primary and secondary films — each only approximately 1,000 angstroms thick — are separated by an even thinner film of silicon oxide, an insulating material, only about 100 angstroms thick. By placing a number of secondary films in series in the D.C. transformer, it is possible to develop a secondary voltage many times higher than the primary voltage. Similarly, by placing a number of primary films in series, the output voltage can be "stepped down" below the input voltage.

The D.C. transformer marks Dr Giaever's second major contribution to superconductor research. In 1960, he announced the discovery that electron "tunnelling," originally observed only in carefully prepared semiconductor materials, also could occur in thin film superconducting devices of far simpler configuration. Subsequent tunnelling studies have added greatly to fundamental scientific knowledge of both tunnelling and superconductivity.

Now, any boy can have fun with electronics . . . and learn while he plays!

with

PHILIPS

ELECTRONIC ENGINEER KITS

Makes up to 20 different working models—opens the door to the wonders of electronics in a simple, easy-to-understand way. Components simply clip into mounting board—no soldering or tool-kit required. Battery-powered for safety.

Two kits and one complementary kit to choose from:

Kit EE8	(8 different models)
Kit EE20	(20 models possible)
Kit EE8/20	(complementary kit)

Please send me details of Philips Engineer Kits.

Name ....

Address

State

WYNYARD
LOTTERY OFFICE
YORK ST
BARRACK ST.
X

Available from

Fox & MacGillycuddy Ltd.
57 York Street. SYDNEY.

YOUR DREAM IS OUR TASK

UHER

Made in W. Germany

THE WORLD'S MOST RELIABLE NAME FOR HIGH PRECISION TAPE-RECORDERS

ATRAM Pty. Ltd.

PROUDLY ANNOUNCE the all NEW MODEL STEREO 724 "A Stereo Tape-recorder for EVERYONE with Professional Qualities."

For professional-semi-professionals-amateurs. Made by the worlds only specialised tape-recorder manufacturers — used throughout the world by Radio Stations, Research Centres Universities and other professionals.

Inspect our complete range of professional models:

ROYAL STEREO
REPORT 4000L
UNIVERSAL 5000

Fully transistorised 4 tracks—2 speeds 2 plus 2 watts — push-pull output. Up to 18,000 c.p.s. at 7½ i.p.s.—7" spool—12hrs. record/playback — trick key —plus many other features.

UHER *A tradition in technical perfection reliability and quality*

by ATRAM P/L MAKE YOUR NEXT CHOICE A UHER

Available in all States.—

N.S.W.: ATRAM PTY. LTD., 5 McLaren St., NORTH SYDNEY, N.S.W. Telephone: 92-4177 (4 lines)
N.S.W.: TOMLIN'S RADIO, 528A Liverpool Rd., SOUTH STRATHFIELD N.S.W., Telephone: 642-4215.
VIC.: ATRAM PTY. LTD., 28 Wellington Street, ST. KILDA, VICTORIA. Telephone: 51-4466: 51-4577.
S.A.: KALLIN DISTRIBUTORS (WHOLESALE) LTD., 140 Gawler Place ADELAIDE, SOUTH AUSTRALIA. Telephone: 8-7171 (11 lines)
W.A.: MUSGROVE'S LTD., 223 Murray Street, PERTH, W.A. Telephone: 21-6611 (8 lines).
QLD.: A. E. HARROLD PTY. LTD. 123-125 Charlotte Street, BRISBAN QLD., Telephone: 31-3081 (10 lines).

The Serviceman

WHEN KILOHMS TURN INTO MEGOHMS

Two stories I have to offer this month have to do with those little components which do so much to keep servicemen "happy, healthy and mild"—as the old phrase runs. I refer to small-size composition resistors which aren't satisfied with being just a few hundred-thousand ohms; they want to grow up into megohms.

If I might offer first a story with something of a "twist," I would begin with mention of a visit to a local watchmaker, a friend of some years' standing. I passed my watch over his counter with the enlightening information that it had stopped.

Would he please fix it for me?

A couple of days later, he dropped in personally with the said watch and a shake of the head.

He explained that, for all its fancy case, it was "just a watch" inside and that it had seen a fair bit of service. He'd have to chase round after the parts to fix it, and "chasing round" costs money, these days." Even after the job was done he couldn't really guarantee the results, because a good deal still depended on the parts that were left.

Maybe it was the time to consider buying a new watch. But . . . it was up to me. He'd have another look at it when he had some time — this without any enthusiasm.

Having delivered himself of this speech, he unwrapped a rather scraggy parcel on the counter to reveal a mantel radio set.

"It's been making all kinds of hums and crackles lately," he explained. Would I fix it for him?

Without seeing any connection between the two situations, I simply said I'd have a look at it. My main worry at the moment was the prospect of having to buy a new watch.

When I did get round to looking at the set, a day or so later, I switched it on and was immediately greeted by the aforesaid hums and crackles. So, without further ado, I slipped it out of its cabinet.

In search of the hums and crackles, I tapped the 6V6-GT output valve — a not uncommon source of such trouble. It sounded as microphonic as any valve I have ever tapped.

But, for good measure, I tapped the valve next to it, under a "goat" shield. It, too, sounded microphonic. So also did the mixer and the 5Y3-GT rectifier.

By the time I had produced much the same result by tapping the tuning gang and an I.F. transformer, I realised that the original 6V6-GT could hardly be blamed. I'd have to go looking.

As a starter, I switched the set off, pulled all the valves out one by one, wiped away the grime of un-numbered years, dribbled a bit of "de-lousing" fluid down through the socket holes and re-inserted the valves, pushing them up and down a few times.

This done, I switched the set on again and waited in vain for the noise and the microphonics. Apparently, the trouble had simply been due to one or more fouled pin contacts.

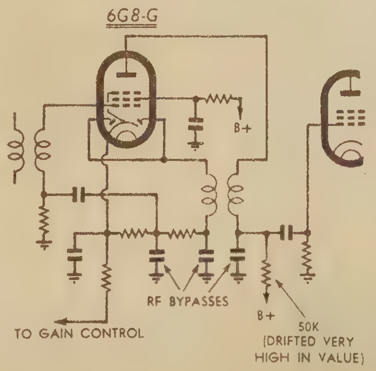
But, even so, I couldn't get wildly enthusiastic about the sound that now became audible. It was distorted above anything more than modest room volume and there was a quite noticeable modulation hum on several of the stations.

In between stations, the hum was no more noticeable than in any ordinary mantel set. But tuned to certain stations, it came riding in on the carrier, loud and clear.

Perhaps I should mention that the set had a built-in loop aerial of the old basket-weave pattern.

The distortion was hardly surprising because, at some time in the set's past, someone had apparently put a finger or two through the speaker cone. So, apart from the speaker being a type which I knew could give trouble, its cone was liberally plastered with sticky tape.

It seemed almost a foregone conclusion that, if the set was ever to sound right, it would have to have a new speaker at least. Then there was the modulation hum. An examination of the underside did little to reassure me, for the chassis was packed drum tight with resistors, capacitors and other components of venerable age.



A reflexed IF stage is not without its problems when everything is operating as intended. But when the plate supply resistor goes high, drastic things happen to performance.

The valve sockets were almost completely hidden from view.

At this stage, I, too, shook my head. With the change of a few nouns, I could easily repeat back to my watchmaker friend his speech about my watch —except that it would involve his radio.

However, I did decide to find the cause of the modulation hum, if I could, without tearing the thing completely to pieces.

Heater wiring: was it earthed?

Yes it was. I could just make out one of the converter heater pins tied down to chassis.

Faulty mixer valve? No, a replacement valve made no discernible difference.

Oscillator B-plus bypass? No, things in this department seemed to be okay.

What about a mains bypass? Here I struck oil. A .0047 mfd. 600-volt tubular from one side of the mains to chassis wiped the hum clean and raised the volume as well. (The set had manual gain control and no AVC).

The same bypass on the other mains lead made not nearly as much difference. It looked like a case for a bypass from both mains leads to chassis.

But, frankly, I don't like mains bypasses. If they break down, they short the mains to chassis and place the full onus of safety on the earth wire in the power cord.

And what of the power cord?

As I looked at it I realised that the rather ancient piece of cotton-covered power flex contained no earth wire, even though it terminated in a regular three-pin plug.

It was the work of a moment to clip on a lead from earth to chassis and the modulation hum disappeared like magic. The odds would be pounds to peanuts that installation of a regular three-wire flex would clean up the trouble without resource to bypasses.

Why, I can only guess.

My tip is that the set was receiving signal from two sources—its own loop aerial and capacitive coupling involving the power mains. The relative importance of the two sources would probably vary with the orientation of the loop and its relationship to the wanted station.

By installing a proper earth wire, the chassis was "earthed" by a reasonably direct path instead of via stray capacitance to the live power lead, with its conglomerate mixture of 50 cycles, and randomly picked up signals from the radio stations.

But, having installed the new lead and got rid of the modulation hum, I was left still with the speaker problem.

Ah, well, best I check the voltages.

This was no mean task, because I couldn't see the spigots from underneath. Each valve had to be pulled from its socket to reveal the spigot from the top, the rest being a feat of memory. By much probing and guesswork, I deduced that the voltages were all likely enough, except the plate voltage of the 6G8-G IF amplifier, which was very low indeed. Normally it should have been pretty close to the main HT voltage.

More probing and my meter revealed that the plate voltage was the same as the voltage at one end of what looked like an 0.5 meg. resistor. Its other end went to B-plus.

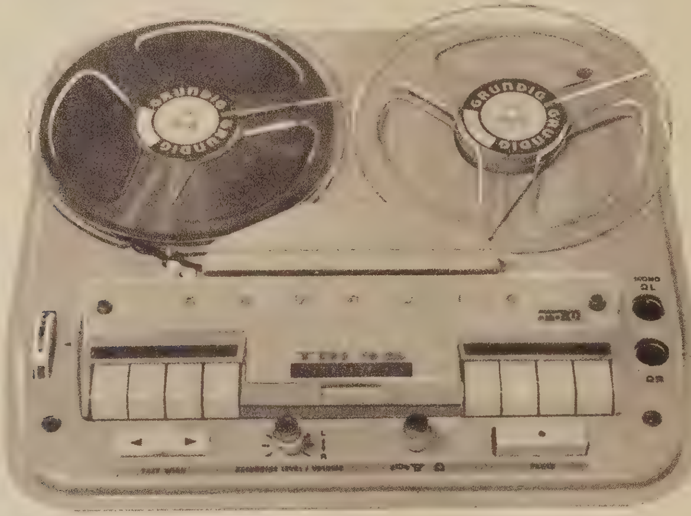
What crazy circuit was this?

In fact, it seemed so crazy that I

"What's the GRUNDIG TM45 got?"

"It's got threespeedfourtrackhi-fidelitystereo recordingandsoundonsoundmultiplay... (whew!) ... *and...*"

"The greatest reproduction!"



This Grundig tape deck is a real thoroughbred. The perfect studio set for professional use. Allows amateurs to keep within their budget and achieve professional results. The Grundig 3-hea 4-track system is switch connected to allow full simultaneous sound on sound and multiplay facilities. Just compare these specifications:

MAINS VOLTAGES:	110, 130, 220, 240 volts.
POWER CONSUMPTION:	48 watts approx.
VALVES:	6, plus 3 rectifiers.
TAPE SPEEDS:	1⅞ ips, 3¾ ips, 7½ ips.
TRACKS:	4 (International Standard) full stereo.
FREQUENCY RESPONSE: + Wow & Flutter	@ 1⅞ (40 to 10,000 c/s) Wow & Flutter .2%. @ 3¾ (40 to 15,000 c/s) Wow & Flutter .12%. @ 7½ (40 to 18,000 c/s) Wow & Flutter .1%.
RECORDING LEVEL:	Magic Eye Band Valve.
MAXIMUM PLAYING TIME:	4 hours per track on 7" spools.

INPUTS:	2 Stereo Microphones (1.5 .. 100 mV/1.5 m ohms). Radi Diode. Phone Input 80 . . 5,000 mV/2.2 m ohms.
OUTLETS:	External Amplifier (2 x 60 mV/15 k ohms). 2 Ear phones.
DIMENSIONS:	14¼" x 13" x 6½".
WEIGHT:	17.5 lbs.
FEATURES:	Rewind time on LP Tape: 14 seconds. Automatic cut-of at ends of Tape. Tap Counter. Sound on soun and multiplay switching.

PRICE: $241.50.

GRUNDIG

Sales & Service

443 Kent Street, Sydney. 29 127

VIC.: 368 Little Bourke Street, Melbourne 67 1197
W.A.: 144A William Street, Perth 21 6500
QLD.: King & King, 77 Queen Street, Brisbane 2 371
S.A.: 77 Wright Street, Adelaide 51 511

GRUNDIG—the world's largest manufacturers of tape recorders.

GE:P

paralleled the meter leads across the resistor, with the meter set to 250 volts —an old trick, I might say.

With the effective 0.25 meg. of the 1,000 ohm-per-volt meter across the 0.5 meg. load, the volume jumped up markedly and the set sounded better into the bargain.

Thoroughly curious now, I probed and prised down among the components and made out an orange dot on the resistor. Whatever the resistor might measure, it was apparently supposed to be 50,000 ohms.

And then light dawned. The set was a reflexed arrangement, with the 6G8-G used both as an IF and an audio amplifier. A resistor of 50,000 ohms, in series with the IF transformer winding, would provide enough plate voltage for the valve to operate reasonably well as an IF amplifier, and enough resistance as an audio load for it to develop useful gain and output.

By a lot more probing and pushing, I was able to replace the nearly open resistor with a new 47K component and, notwithstanding the heavily patched loudspeaker, the set didn't sound too bad.

So, in due course, I put the set back in its cabinet and tore up my prepared speech to its watchmaker owner.

In its place I would deliver another, much shorter.

He would ask, "How much?"

That would be my cue to say, "About the same figure as you're going to charge to fix my old and decrepit timepiece!"

So much for my venture into "horse trading."

OTHERS, TOO, HAVE THEIR PROBLEMS

The article which has always interested me in your magazine is "The Serviceman Who Tells" and I have had many laughs at the experiences he has run into. But something happened to me last month that you may be interested in hearing about.

It started out as what I thought would be a normal service job, following a call to the shop by a customer. At the house, the back of the set was duly removed and it seemed like a straightforward case of EHT failure. After checking, however, the video output valve was found to be suffering from an open-circuited heater. I fully expected that replacing this would restore the set to normal operation, my snap observation about no EHT having presumably been astray for some reason.

About this time, the eldest son of the household walked in and showed an immediate interest in what I was doing. He observed that the fault must be "pretty complicated" because he had already tried to fix the set himself, without success. He then went on to relate some of the things he had done in an effort to get the set working again.

First off, he had observed that the 1S2 filament did not seem to be lighting up properly, or as he described it, "that little lamp with the lid on." He removed the 1S2, therefore, and took it to a shop for testing. Being told that the valve was okay, he decided that there must be something more seriously wrong with the set than just the valve. He then noticed that the "little wheel" in the "little cage" would rotate only about half a turn, which didn't seem at all right, and he fixed that with a bit of persuasion!

But even this did not restore the picture, so he removed the set from its cabinet for a closer look at things. In doing so he happened to break the wire "which plugs into the side of the screen" but he thought that this wasn't a very important wire anyway—or so he told me.

Back to the 1S2, he decided to remove the wires from the socket—apparently for cleaning—along with the little thing (the resistor) mounted inside. Then he fed the wires back inside the base, filling the whole thing with cold solder which, he assured me, held the wires quite securely.

By this time, I was utterly dumbfounded and decided that my only course was to take the whole thing back to the shop where I could sort things out in solitude. At the back of my mind was the hope that it was all a joke and that he hadn't really treated the set in the manner described.

But, unfortunately, every word of his story was true. I managed to return "the little wheel" to its correct position and resolder the connections which had been twisted off it.

The 1S2 socket and wiring had to be replaced entirely, the lead to the picture tube coating restored and, finally, a new 6DX8 installed. The set then came to life, indicating that the original fault had probably been the o/c heater.

But how can people be so ignorant as to think that a twist here and a pull there will fix a radio or TV set? I suppose it takes all kinds . . .

(B.W., Laverton, Vic.)

THE LOST CHORD?

In the everyday round of purely routine service jobs, the occasional unusual type of call provides variety, even if one can never be quite sure which way it will show up on the profit and loss account. Such a call was a recent one from a small nearby church.

The organist, who sought my help, had a smattering of electronic knowledge, picked up, apparently, from dealings with high fidelity record playing equipment. However, while he knew the language he wasn't at all familiar with the finer points of amplifier operation.

He explained that the organ no longer sounded as "clean" as once it had, the deterioration having become very marked during the past couple of weeks. Played a note at a time, or even a couple of notes, it didn't sound too bad, but, with complex chords and particularly with a bass pedal added, the sound became "really horrible."

"Could it be this intermodulation, which he had heard so much about?"

He had come to me, he explained, because he felt that it was purely an amplifier problem, which should be right in my barrow. He even offered to take the amplifier out for me, so that I wouldn't have to waste too much of my time undoing screws and nuts.

What could I do but make arrangements to meet him later at the church and have a listen and a look?

In the meantime, I vaguely recalled the remark of a fellow serviceman who had dealings with the same kind of organ—a small, locally made instrument: Something to the effect that "the amplifier is full of half-watt resistors that go high in value."

If this was the case, the right kind of instrument to take along would be an R/C bridge. With this and a multimeter, I should be able to find faulty resistors or leaky capacitors.

When I finally heard the instrument, it was exactly as the organist had described, with intermodulation so bad that it could only be something very obvious in the amplifier or a faulty speaker.

Naturally enough, my first action on gaining access to the underside of the amplifier was to cross-check the voltages with those listed in the manual, which had happily been supplied with the instrument. The main H.T. was okay, but some of the other voltages didn't check.

Let's have a look at the resistors, then.

So, working with the circuit and the colour code, I checked each resistor in turn, for value, disconnecting one end of those which had parallel paths across them.

What a mixture showed up.

Most of the lower values were still within tolerance, as also were several others which had not been subject to direct current. But in the voltage regulator circuits, which had to do with the oscillator keying and blocking, I found several close tolerance resistors, which were way out. One 510K measured just under 3 megohms!

Seeing this prompted recollection of another of my confrere's remarks about wrong value resistors causing keying difficulties in this type of organ—oscillators which wouldn't start or wouldn't stop, or plopping when the vibrato was used.

TRANSISTOR SERVICE

ALL JAPANESE MAKES

REPAIRED

including . . .

Aristone Aurora Belair
Berlin Crown Fujiya
General Hitachi Kenco
Mariner Mitsubishi Nanaola
National Nivico Sanyo
Sony Spica Standard
Sharp Toshiba Yashica

We do not sell spare parts

PETER G. BROUGHTON
211 George Street
Sydney Tel. 27-5831

Telecomponents parts are tailored to fit without modification to circuitry or construction

The Telecomponents complete guarantee is your assurance of satisfaction

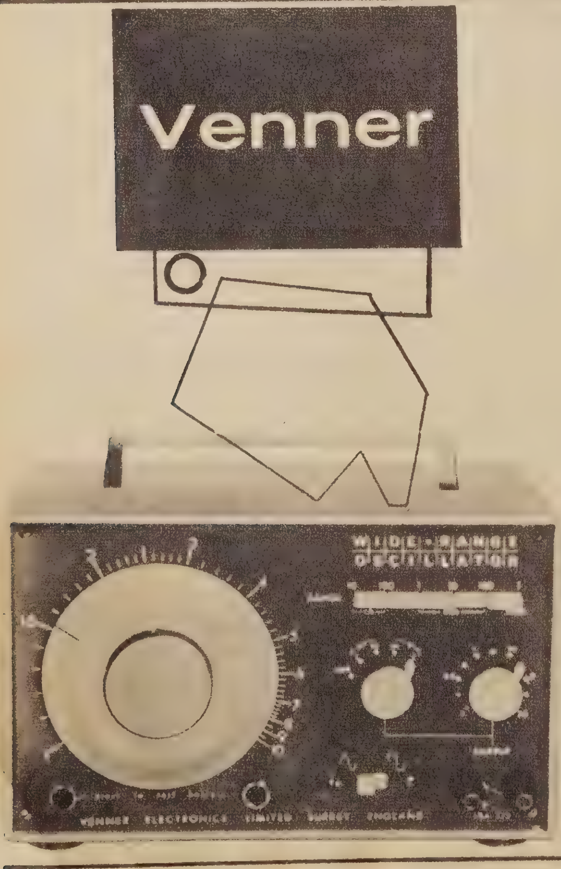
All Telecomponents parts are catalogued under set Brand for easy reference

TELECOMPONENTS PTY. LTD.

(A division of Ferris Industries Limited)

STOCKED BY FERRIS BROS. PTY. LIMITED: Sydney: 93 0221. Melbourne: 42 3141. Brisbane: 68 4344. Newcastle: 61 5071. Wollongong 2 1922. Canberra: 9 0325. Wagga: 3888. Townsville: 3444. Rockhampton: 4041. SYDNEY: Universal Car Radios Pty. Ltd., 35 4356 and 74 148 General Accessories Pty. Ltd., 73 0211. Standard Components Pty. Ltd., 68 3254. Lawrence & Hanson Electrical Pty. Ltd., 69 4041 and 43 227 Electronic Parts Pty. Ltd., 560 7566. George Brown & Co. Pty. Ltd., 29 7031. Mellor Bros., 74 9478. NEWCASTLE: Martin de Launay Pty. Ltd 2 4741. WOLLONGONG: 2 6020. MELBOURNE: Television Replacements, 34 1225. Radio Parts Pty. Ltd., 30 1251. Douglas Radio Co., 211 169 General Accessories Pty. Ltd., 69 0300. Warburton Franki Industries (Melb.) Pty. Ltd., 69 0151. BRISBANE: General Accessories Pty. Ltd 2 3093. TOWNSVILLE: General Accessories Pty. Ltd., 6061. W.A.: Tedco Pty. Ltd., 21 2561. Carlyle & Co. (1959) Pty. Ltd., 21 9331. S.A.: Tyqui Distributors Pty. Ltd., 57 8153. MT. GAMBIER: Stewart Day, 2 3889. TASMANIA: W. & G. Genders Pty. Ltd., Launceston, Devonport, Hoba and Burnie.

48



transistorised wide range oscillator TSA 625

battery operated
frequency range 10 c/s-1 M c/
sine or square wave output
long scale length
push button range selection
light weight

sole australian agents

H. ROWE & CO. PTY. LTD.
MELBOURNE SYDNEY BRISBANE
ADELAIDE HOBART PERTH

In the amplifier proper, a plate load resistor which should have been 100K read nearer 200K, while two other resistors in the phase splitter had shifted from 120K each to much more than 200K in one case. Since this was a direct coupled arrangement, I could well imagine what could happen to the operating conditions with such a shift in plate and cathode resistor values.

In the face of all this, there didn't seem to be much point in trying to analyse the effect of each and every off-value resistor, so I simply went through the amplifier checking and replacing resistors as necessary.

Now what about the capacitors?

A check around the circuit showed no positive grid potentials to suggest a leaky coupling circuit and, while the rest of the voltages looked much more likely—except at the plate of the first 12AU7 amplifier stage. Instead of something up around the 100 mark, which would have represented a reasonable proportion of the supply voltage, it was down around 40 volts.

Since I had just replaced the plate supply resistor, the low voltage could only mean that the valve was drawing unusually high current.

Perhaps the cathode bias circuit was shorted? Maybe the valve was gassy?

But the cathode bias circuit wasn't shorted. In fact, there was nothing there but a 2.2K resistor, across which a definite positive voltage was evident.

So I shorted the grid to earth and immediately the plate voltage almost doubled. There seemed to be no doubt about it; the 12AU7 was gassy.

But, alas, another 12AU7 behaved in exactly the same fashion, as also did a third, borrowed from the organ tone generator. Having duly replaced the original valve and repeated the test, I was faced with the seeming alternatives that (1) I was crazy or (2) all 12AU7 valves were gassy.

Then I took another careful look at the circuit. Although there was quite a parcel of components tied to the grid, there was no earth return path until the input leads were connected. Naturally enough, with no earth return path, bias generated in the cathode would be ineffective, so that the low plate voltage was simply the result of unnatural zero bias operation.

Having thus dispensed with the difficulties, real and imaginary, the amplifier was reconnected to the organ and put through its paces.

My own ears and the look on the organist's face both testified that harmony had been restored!

★ ★ ★

To change the subject. A recent job which I had to do on a car radio had some interesting overtones.

The job on the radio itself was relatively straightforward, involving the replacement of a switch-pot, which had decided not to switch any more. The owner simply drove the car around and stood by while I diagnosed the trouble and removed the set from its cradle — fortunately a very simple task. A few hours later, after I had installed a new control, he called around again for me to replace the receiver.

While re-installing the set, I noticed that the aerial lead seemed to follow a rather illogical route amongst the paraphenalia behind the facia so, curled up on the front floor and aided by the light of a torch, I set out to re-locate it — something that shouldn't have taken more than a minute or so of my time.

And then I noticed that the lead passed loosely through a rather ragged hole in a side panel, with no bushing of any kind; further, a track of dried mud led vertically downwards behind a cardboard panel near the front passenger's feet.

I mentioned this to the owner and, with him standing on his head outside the car, it didn't take long to verify that the lead passed through into an open space underneath the front wing and behind the front wheel. With the car travelling at speed on a wet road, mud and water, flung up from the front wheel, and urged on by the air pressure under the front wing, must obviously have been trickling through the unplugged hole around the aerial lead.

When the car owner reappeared the right way up, he wore a "that-explains-it" expression on his face. He went on to explain that ever since the car had been new, he had been suspicious of a dampness around the edge of the mat under the passenger's feet but the dealer, after liberally spraying the car with a hose had sworn that it was completely watertight.

Next thing I knew, the owner had rolled back the rubber mat and whipped off the cardboard panel to reveal quite a large area of surface rust. Ahead of him was the obvious task of cleaning, coating and painting to arrest further deterioration.

But could I stop the leak?

By pushing the lead out through its entry hole and having a look at things, it was apparent what had happened.

Whoever had fitted the aerial—and it had been done by the original distributor — had apparently attacked the bulkhead with a large high-speed portable drill so that, instead of getting a clean round hole of the anticipated size, he had ended up with a triangular hole, heavily burred.

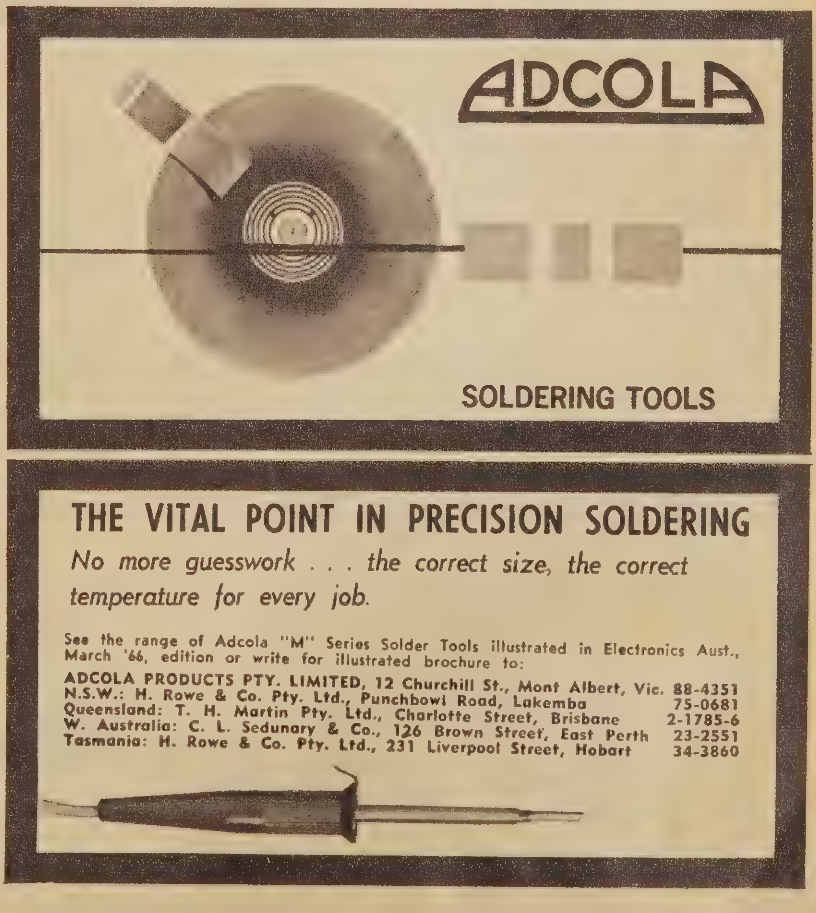
The grommetted end of the shroud which should have protected the aerial lead and sealed the edges of the hole hadn't fitted, but our friend hadn't let that worry him. He'd just pulled the lead through, leaving the rubber shroud floating free under the wing, plugged the aerial into the radio and gone off home.

I wonder how many other cars had been similarly treated?

Anyhow, by lying on my back and wielding a file up under the wing, I managed to clean off the burr and to get the grommetted end of the shroud properly in position. Fortunately, although the hole was far from round, it did seem to hold the grommet firmly and to provide, as far as I could judge, a reasonably watertight seal.

Just to make sure, however, I located some caulking compound of the non-hardening variety, which I had around the place for other reasons, and worked it into position around the grommet.

If observation is required, let me frame one this way: I've seen some strange radio installations in my day but this is the first one I've come across which was conspiring to turn a family saloon into a "rust-bucket." ■


ADCOLA

SOLDERING TOOLS

THE VITAL POINT IN PRECISION SOLDERING

No more guesswork . . . the correct size, the correct temperature for every job.

See the range of Adcola "M" Series Solder Tools illustrated in Electronics Aust., March '66, edition or write for illustrated brochure to:

ADCOLA PRODUCTS PTY. LIMITED, 12 Churchill St., Mont Albert, Vic. 88-4351
N.S.W.: H. Rowe & Co. Pty. Ltd., Punchbowl Road, Lakemba 75-0681
Queensland: T. H. Martin Pty. Ltd., Charlotte Street, Brisbane 2-1785-6
W. Australia: C. L. Sedunary & Co., 126 Brown Street, East Perth 23-2551
Tasmania: H. Rowe & Co. Pty. Ltd., 231 Liverpool Street, Hobart 34-3860

Danish Hi-Fi Pty.Ltd.

offers a few suggestions for music lovers who are looking for good value in mono or stereo from records, radio or tape.

Offer 1.

Peak ST-100 Amplifier 10 watts (5 watts per channel), two Bang & Olufsen bookshelf speakers type B. SRT 643 turntable on imported base

$180 - £90.

Offer 2.

Clearway wide band AM radio tuner (Melbourne only). Beogram 2000 portable 4 track stereo tape recorder with solid state 8 watt per channel main amplifier and three sets of pre-amplifiers for Radio, Microphone & Gramophone.

$544.50 £272. 5. 0

Offer 3.

Choice of DYNAKITS unassembled.

SCA35 17 watt RMS per channel. True HI-FI with pre amp.	$169.
Mono pre amp PAM1	$59.
Stereo pre amp PAS3	$108.
Mono power amp MK3 60 watts	$136.
Mono power amp MK4 40 watts	$102.
Stereo 35 power amp	$102.
Stereo 70 power amp	$169.

Offer 4.

B & O HI - FI amplifier type 610, 15 watts per channel, Beogram 1000 turntable with 15° arm, SP7 cartridge, oil damped pickup lift on imported base and plastic cover. Including two M type B & O bookshelf speakers.

$351.40 £175.14. 0

Offer 5.

Jobo model 2800 turntable, with All Balance arm and SP8 cartridge with elliptical stylus, B & O 1000 solid state 15 watts per channel amplifier and two S type B & O speakers.

$496.60 £248. 6. 0

Offer 6.

Here is a standard of reproduction which is truly exceptional and must be heard to be appreciated. The Clearway solid state amplifier with 605L Labcraft turntable, B & O ST/M arm, pickup lift and two Bang & Olufsen type K speakers.

$483.60 £241.16. 0

MADE - IN - DENMARK HI-FI STEREO, TAPE RECORDERS RADIOS, SPEAKERS, MICROPHONES AND ACCESSORIES.

B&O

Labcraft

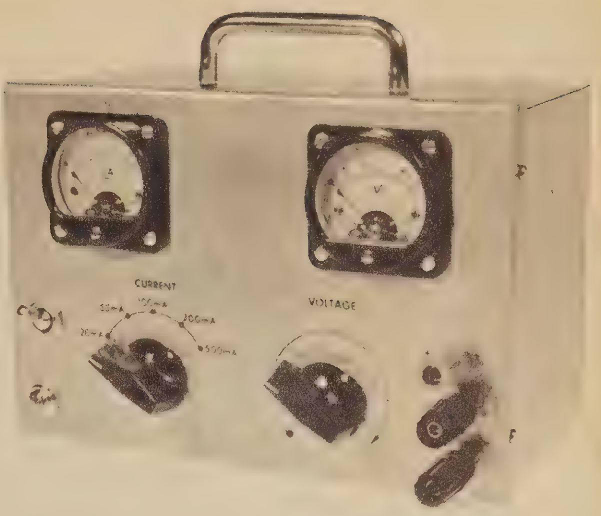
DANISH hi-fi

SRT

TELEPHONE 82-4839
66 MAYSTON STREET
HAWTHORN EAST E3
MELBOURNE, VICTORIA

SELECTIONS FROM THE FINEST OF AUSTRALIAN AND IMPORTED EQUIPMENT

A FULLY PROTECTED VARIABLE DC SUPPLY FOR TRANSISTORS



Described in this article is a new variable voltage transistor power supply which is not only regulated but which is also fully protected against damage on full short circuit. The output voltage is variable from 6 to 25 volts and the maximum short-circuit current is 500 milliamps. These ratings should meet most requirements.

By Ian Pogson

The Protected Transistor Supply which we are about to describe may well be considered as superseding the Power Supply for Transistors which was presented in April, 1962. This unit is capable of doing a good job and no doubt those that are in service will continue to do so. However, the increasing availability of transistors with higher voltage ratings has shifted the design emphasis somewhat.

Whereas the earlier unit was designed to be constantly variable from 0 to 15 volts, with a maximum current capability of 1 amp, the new one is constantly variable from 6 to 25 volts, with a current output somewhat less than 500 milliamps.

In deciding what the new ratings should be, a number of factors were taken into account. There seemed to be little point in making the minimum voltage available less than six volts, considering present-day requirements. On the other hand voltages above 15 are often required, 22 volts being a common figure. So 25 volts seemed to be the logical upper limit.

The maximum current available at 25 volts under full regulation conditions is about 300 milliamps. This upper limit has been dictated by economy and the fact that not a great deal of equipment calls for more output than this supply can deliver. The more common pieces of equipment which require high current supply are audio amplifiers and car radios, using class A output stages. As these are in the minority, it was felt that the extra cost involved in producing a supply capable of delivering 1 amp or so would not be justified.

Possibly the most attractive feature of this transistor supply is the overload protection, even on a direct short-circuit. This protection circuit is adjustable so that the short-circuit current is 500, 200, 100, 50 or a nominal 20 milliamps.

Both the protection circuit and current metering are switched simultaneously. This means that whatever range is selected, short-circuit protection occurs at the figure which corresponds to full scale reading of the current meter.

Under certain circumstances, the overload protection circuit may be used to give some measure of protection to the equipment being fed from the supply. Suppose we have a circuit with an expensive transistor incorporated and there may be a hidden fault, whereby the transistor in question may draw excessive current, so leading to its destruction.

Suppose that the transistor in question will pass 100 milliamps without damage but a higher current would destroy it. By setting the short-circuit switch to 100mA, the transistor will be saved from damage because the power supply will not deliver more than 100mA. It is assumed, in this example, that the normal current requirement is less than 100mA.

A check on the circuit diagram will show that at least parts of it are what may now be considered to be a conventional approach to this sort of power supply. The mains transformer has two 6.3 volt 1 amp windings, connected in series. A voltage doubler gives something in excess of 35 volts of unregulated DC.

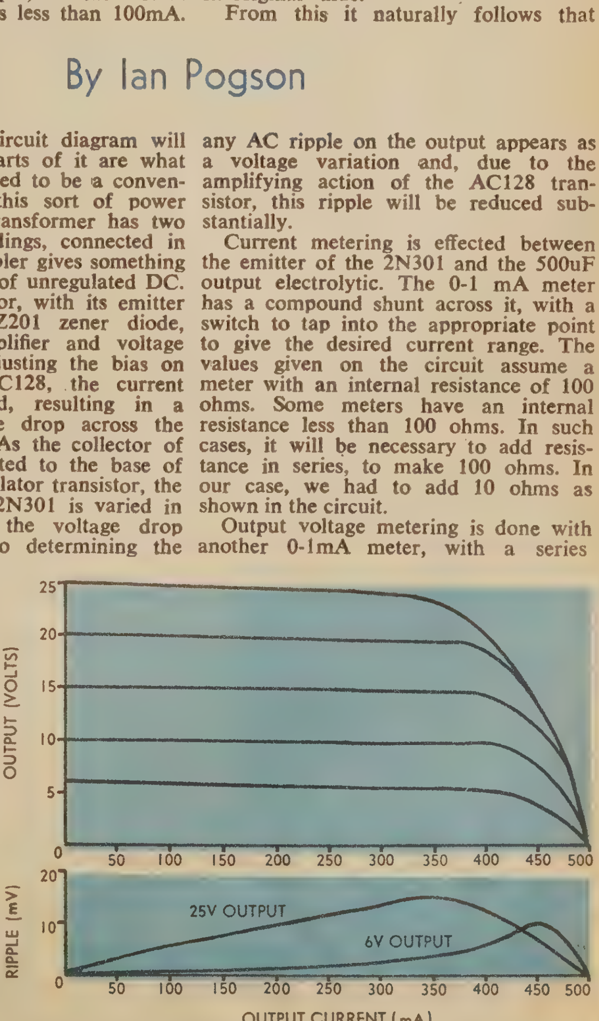
An AC128 transistor, with its emitter referred to an OAZ201 zener diode, functions as an amplifier and voltage control stage. By adjusting the bias on the base of the AC128, the current through it is varied, resulting in a corresponding voltage drop across the 1.8K collector load. As the collector of the AC128 is connected to the base of the 2N301 series regulator transistor, the forward bias of the 2N301 is varied in turn. This controls the voltage drop across the 2N301, so determining the output terminal voltage.

As the base of the AC128 transistor has its voltage set from the output circuit, it "samples," so to speak, the output voltage and any variation here due to changes in load current etc., are amplified and the bias on the 2N301 base is varied accordingly. This, in turn, alters the voltage drop across the 2N301, to restore the output voltage to very near its original value.

From this it naturally follows that any AC ripple on the output appears as a voltage variation and, due to the amplifying action of the AC128 transistor, this ripple will be reduced substantially.

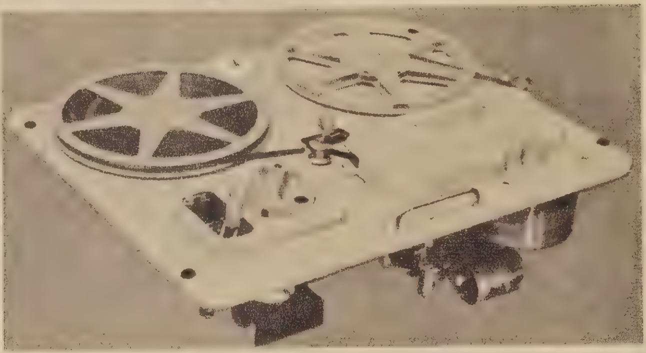
Current metering is effected between the emitter of the 2N301 and the 500uF output electrolytic. The 0-1 mA meter has a compound shunt across it, with a switch to tap into the appropriate point to give the desired current range. The values given on the circuit assume a meter with an internal resistance of 100 ohms. Some meters have an internal resistance less than 100 ohms. In such cases, it will be necessary to add resistance in series, to make 100 ohms. In our case, we had to add 10 ohms as shown in the circuit.

Output voltage metering is done with another 0-1mA meter, with a series



Curves for six output voltage settings show at a glance the degree of regulation which can be expected at various load currents. Ripple voltage curves also tell their own story.

WEARITE, the Tape Deck for the enthusiast



At last the quality conscious tape enthusiast can have a tape deck that combines broadcast standard fidelity with extreme robustness and moderate price.

THREE SPEEDS (1⅞, 3¾, 7½) THREE HEADS THREE MOTORS

The famous "Wearite" ¼ track and ½ track decks are now available for only £85/0/0 plus sales tax (£10/12/6) for the stereo model, and even less for the mono. Supplied with each deck is a comprehensive 35 page technical manual showing you how to make up a complete recorder from your deck. Special items, as used in the factory, can be supplied, e.g., Head lift transformer, Oscillator Coils, Treble Boost Inductors, Smoothing Chokes, Bias Blocking Filters, etc. Without a doubt the Wearite Series 6 tape deck is the finest available to the enthusiast and with the technical information and special parts available, the building of a high quality tape recorder becomes a practical and economical proposition.

If you prefer, we can supply decks complete with pre-amplifier control panel and all controls ready for plugging into your power amplifier for £175/0/0 plus 12½% Sales Tax.

Our control unit and pre-amplifier is so comprehensive that there is not space to describe it here. A full description is available on request.

Send for a free descriptive leaflet or remit 12/6 and a technical manual will be sent to you by return mail.

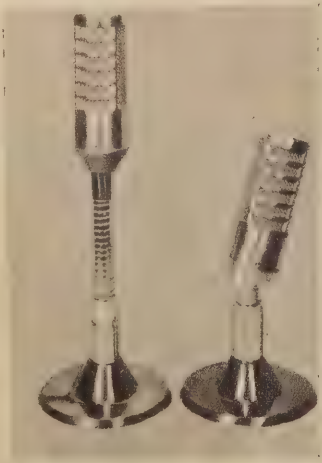
S.A.
Eilco Sales Pty. Ltd.
9 Osmond Terrace,
NORWOOD, S.A.

VIC.
Simon Gray Pty. Ltd.,
28 Elizabeth Street,
MELBOURNE, VIC.

N.S.W.
Simon Gray Pty. Ltd.,
26 Ridge Street,
NORTH SYDNEY, N.S.W

ALL OTHER STATES
LEROYA INDUSTRIES PTY. LTD.,
672 Hay Street, Perth, W.A.

THE IDEAL MICROPHONE FOR TAPE RECORDING



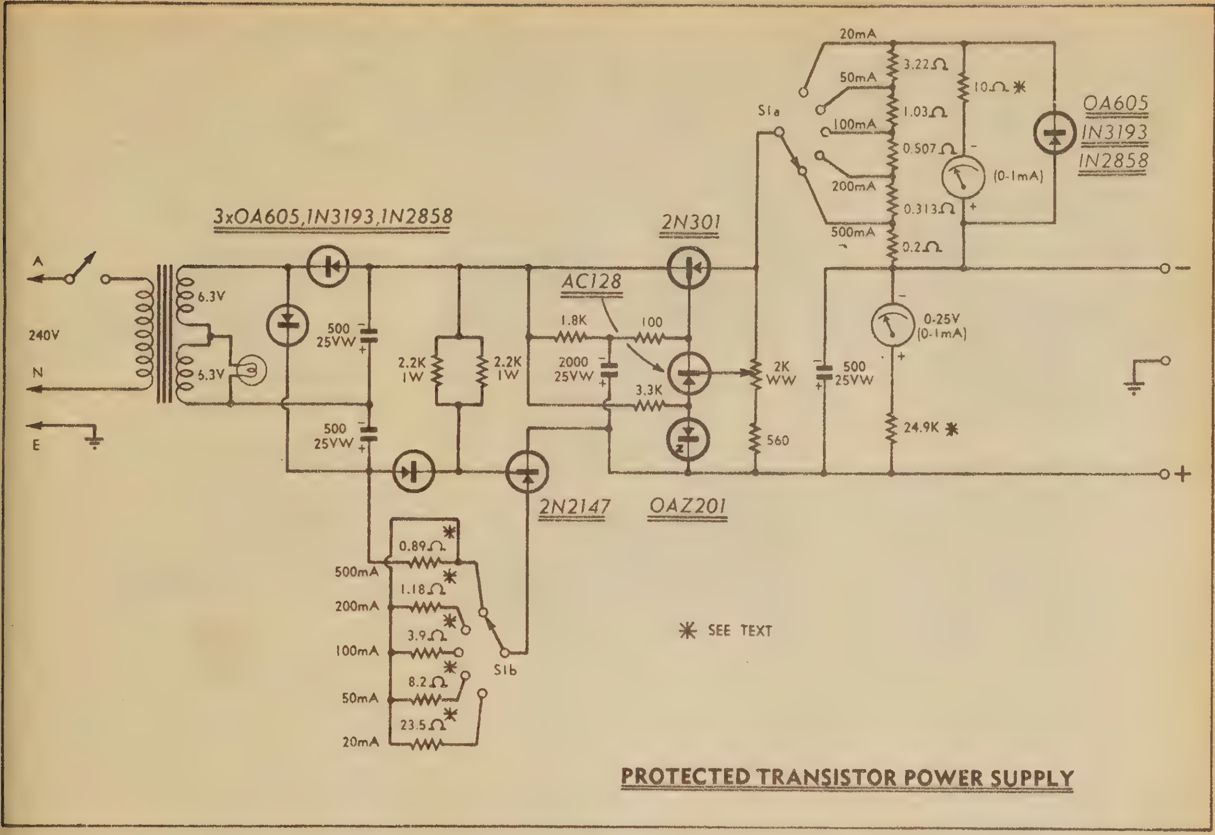
Made by Film Industries Ltd., of England, the M8 ribbon microphone gives you, low distortion, extended frequency response and small size.

Frequency response	**35-18,000 cps (35-13,000 ± 3 db)**
Size	**1.3/8 x 3.3/8 weight 8 oz.**
Price	**£22.10.0. plus sales tax (£2.16.3.)**

TRADE ENQUIRIES WELCOME

LEROYA INDUSTRIES PTY. LTD.

672 Hay Street, PERTH. W.A.



PROTECTED TRANSISTOR POWER SUPPLY

The circuit diagram is relatively simple for the facilities it offers. Overload protection is of a high order, including the 100-ohm resistor to protect the regulator transistor and the silicon diode to protect the meter movement.

resistance of 24.9K. Again, this value assumes the use of a meter with a 100 ohm movement. The 24.9K resistor may be made up with a 22K and a 2.7K in series. This still leaves an error of 200 ohms and may be made up if desired but without it, the error will be less than 1 p.c.

The 100 ohms resistor between the 2000uF capacitor and the base circuit of the 2N301 is provided to protect this transistor against a sudden short circuit. Without this resistor, in the event of a sudden short circuit across the output, the capacitor would discharge through the base of the 2N301, leading to its destruction. A gradual increase of the external load up to a short circuit does not result in this problem, as there is time for the capacitor to discharge gradually.

The overload protection circuit consists of a 2N2147 power transistor, a low voltage silicon diode and a set of resistors, with switching to determine the maximum current to be delivered by the supply across the output terminals. The type 2N2147 transistor was chosen for this position, because of a combination of its high current gain and low bottoming voltage. These characteristics are superior to those of types such as the 2N301, for an application of this nature.

The silicon diode, between the base and emitter of the 2N2147 transistor, is conducting a current of the order of 30mA all the time. This means that there is a fixed forward voltage drop across the diode, which may lie between about 0.4 to over 1 volt, according to the diode being used. This voltage is applied to the base of the 2N2147 transistor. In turn, this transistor is in series with the supply current, with a selected resistor in its emitter.

With no external load on the supply, the only current flowing around the circuit, apart from that through the biasing diode, is the bleed current which only amounts to a few milliamps. Under these conditions, the 2N2147 is bottomed (fully conducting) by virtue of the bias applied by the diode between the base and emitter. In the case of our unit, this bias is about 0.7 volt and with the small bleed current, the voltage developed across the emitter resistor can be neglected.

With the application of an external load, increasing current results in a voltage drop across the selected emitter resistor. This will have little effect at first, but as this voltage approaches the nominal 0.7 volt on the base, the forward bias is consequently reduced. As the knee of the 2N2147 is reached, the voltage rapidly increases across this transistor, thus sharing the total voltage drop with the 2N301 regulator transistor. The proportion in which this voltage sharing occurs will depend upon the output voltage setting of the 2K potentiometer.

PARTS LIST

1 Instrument case, 7½in x 5in x 4in, with front panel.
1 Chassis, 5½ x 3-7/8in x 2¼in.
1 Handle for case.
2 0-1 mA meters, approx. 2in square, 100 ohms, with suitable scales.
1 Power transformer, 2 x 6.3V 1A.
1 Rotary switch, 2-pole 5-position.
1 SPST toggle switch.
1 Bezel and 6.3V lamp.
1 10K wire wound potentiometer.
1 OAZ201 zener diode.
4 Silicon diodes (OA605, 1N3193, 1N2858).

RESISTORS

(preferably 5% tolerance)

1 0.27 ohm ½W.
1 0.33 ohm ½W.
1 0.56 ohm ½W.
1 0.82 ohm ½W.
1 1.2 ohms ½W.
1 3.3 ohms ½W.
2 5.6 ohms ½W.
1 6.8 ohms ½W.
1 150 ohms ½W.
10% tolerance.
1 100 ohms ½W.
1 560 ohms ½W.
1 1.8K ½W.
2 2.2K 1W.
1 3.3K ½W.

See text for details of resistors marked on circuit with asterisk.

CAPACITORS

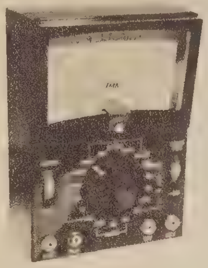
3 500uF 25VW electrolytics.
1 2000uF 25VW electrolytics.

SUNDRIES

1 Miniature 10-tag strip.
5 Miniature 3-tag strips.
1 Miniature 2-tag strip.
3 Terminals.
3 3/8in rubber grommets.
4 Rubber feet.
2 Knobs.
Power cord, 3-pin plug, hook-up wire, screws, etc.

MASTER ELECTRICS PTY. LTD.

A WHOLLY OWNED
SUBSIDIARY OF
MOTOR SPARES LTD.



TMK MODEL 300 MULTIMETER

Ranges— DC Voltage:	0 - 0.5 - 2.5-10.50-250-1K-5K volts at 20,000 ohms/volt.
AC Voltage:	0-2.5 10-50-250-1000 volts at 10,000 ohms/volt.
DC Current	0-0.05-25-500 Milliamperes.
Resistance:	0-2K-200K, 0-2M-20M ohms (12-1200-12K-120K ohms at midscale).
Buzzer:	Internal, for circuit checking.
Decibels:	—20 to +62 DB in five ranges, where 0 DB = 1 mW into 600Ω line
Size:	145 × 100 × 56mm. (5.5/8" × 4" × 2.¼" approx.)
Weight:	0.57 kg. (1.25lb).
Batteries:	Burgess Y10 (15v). Burgess Z (1.5 v) or equivalents.
Accessory:	1 pair test leads.

$21.30

TMK MODEL 700 MULTIMETER

DC Voltage:	8 ranges: 20,000 ohms per volt — 0-0.25-2.5-10-50-100-250-1000-5000 volts.
AC Voltage:	7 ranges: 4000 ohms per volt — 0.2-5-10-50-100-250-1000-5000 volts.
Direct Current:	6 ranges: 0-50uA 0-0.5-5-50-500mA 0-10A
Altern. Current:	5 ranges: 0-0.5-5-50-500mA 0-10A
Resistance:	5 ranges: × 1 — × 10 — × 100 — 1K — 10K (30, 300, 3000, 30K 300KΩ at centre)
Decibels:	—10 to +42 dB (0 dB = 1 mW in 600 Ω)

$54.00

PAROS 760 12 TRANSISTOR SOLID STATE 4 TRACK STEREO TAPE RECORDER

Specifications

Recording System:	In line 4-track stereo and monaural recording.
Record and playing time:	(4-track stereo) 7½, 3, 3¾, 1 7-8. 1,2000ft 1hr, 2rs, 4hrs. 1,800ft 1.5hrs, 3hrs, 6hrs. 2,400ft 2hrs, 4hrs, 8hrs. (4-track monaural) 7½, 3¾, 1 7-8. 1,200ft 2hrs, 4hrs, 8hrs. 1,800ft 3hrs, 6hrs, 12hrs. 2,400ft 4hrs, 8hrs, 16hrs.
Transistors:	12 transistors.
Diodes:	2 diodes.
Thermistor:	1 thermistor.
Reel size:	Up to 7in.
Heads:	¼ track lamination type record/play head, double gapped high efficiency erase head.
Bias frequency:	90kc.
Frequency response:	40 cps—15,000 cps.
Signal to noise ratio:	Better than 40 db.
Cross talk:	Better than 40 db.
Output power:	10 watts (5 watts/5 watts)
Inputs:	Mic.: input level—60 db, impedance 50k ohm. Aux.: input level — 10 db, impedance 50 k ohm.
Outputs:	Ext. amp.: output level—40 db, impedance 5 k ohm. Ext. S.P.: output level 3 watts each, impedance 8 ohm.
Speaker:	Two oval 4in x 6in hi-fi dynamic speakers.
Tape speed:	3 speeds (7½ ips, 3¾ ips and 1 7-8 ips)
F.F. speed:	110 sec.
Rewind speed:	150 sec.
Wow and flutter:	less than 0.17 p.c. WRMS
Motor:	New heavy duty 4-pole induction motor.
Automatic stopper:	Operates at the end of tape or when the tape is cut off.
Power requirements:	90 watts.
Dimensions:	380 (W) x 517 (H) x 214 (D) mm.
Weight:	33lbs.
Standard accessories:	7in empty reel—1 Hi-Fi type dynamic microphone —2. Patch cord —2 (with plug and alligator clip). Power supply cord —1. Rubber .heel holder —2.

$220.00

SPECIALS

1. Power Transformer Type D3830 Primary 240 Volt AC—Secondary 240-0-240 at 60MA, 6.3V at 2.5 amp. Manufacturers type upright mounting. Price $3.00.
2. Power Transformer Type D7255 Primary 240V AC Secondaries 180-0-180 at 40 MA 12.6V at 1 amp. Manufacturers Type upright mounting. Price $2.00.
3. Transistor Driver Transformer Type D8467 Primary 3000 Ohms Secondary 133 Ohm CT. Manufacturer type upright mounting. Price 99c.
4. Transistor output Transformer type D5448. Primary 375 Ohm CT. Secondary 3.5 Ohm. Manufacturers type upright mounting. Price 99c.
5. Power Transformer Primary 240V AC Secondaries 180-0-180 at 40 MA and 6.3V at 2 amp. Manufacturers type upright mounting. Price $3.00.
6. Power Transformer Primary 240V AC Secondaries 225-0-225 at 50 MA and 6.3V at 2 amp. Manufacturers type upright mounting. Price $3.00.
7. Four-Speaker Sound Columns—Imported and excellent quality. Unbreakable Bakelite case 24 inches high 5½ inches wide and 3¾ inches deep. Maximum Power Input 6 watt — impedance 15 ohms. Ideal for all P.A. systems. Price $22.75.
8. Sinclair X-20 Pulse Width Modulated Amplifier and pre-amp. Power output 20 watts RMS. Frequency response 20 c/s to 20 KC/S Plus 1DB. Supply Voltage 28 to 40 volts. Could be purchased in either Kit form or assembled on a printed circuit board ready to be fitted into any cabinet.
   X20 Kit, $26.90.
   Built, $33.00.
9. Single Pole Double Throw 2 amp 250 volt Key Switch. Can only be operated by inserting key. Ideal for Secret ignition tamper proof equipment. Price 75c.
10. Q Plus RC-6 Miniature Reinartz Coils specially reduced to clear at below cost. Price $1.00.
11. 455 KCS I.F. Transformers, medium gain in standard size or miniature Philips type suitable for valve receivers. all brand ned. Price 75c.
12. Carbon Potentiometers 250K with single pole switch. Brand new and Boxed. Curve C. Price 60c.
13. 240V AC Power Adaptor output 6 volt, 9 volt and 12 volt at ½ amp. Ideal for transistor radios and tape recorders. Price $12.50.
14. Single Pole Single Throw Rotary type switch with ¾inch x ¼ inch shaft. Price 20c.

547 ELIZABETH STREET, MELBOURNE — Phone 30-0271

BRANCHES THROUGHOUT VICTORIA AND RIVERINA

By this method, all the components of the power supply are thereby protected against overload. It will be seen that the value of the selected resistor in the emitter circuit of the 2N2147 transistor will determine the maximum current which will be passed by the system.

The emitter resistor which controls the 500 milliamp short-circuit current is arranged in the switching so that it is permanently in circuit. This has been done as a safety measure. In the process of switching, with shorting type switch rotor contacts it would be possible for this lowest value of resistor to be connected in parallel with the next value. This would result in a lower value of emitter resistance and so the short-circuit current would be in excess of that which may be a safe value.

Before leaving the description of operation of the circuit, a couple of other points are worthy of mention. With the voltage setting potentiometer set for minimum output voltage, the AC128 transistor can get quite warm, although it is still well within its ratings. As an extra precaution, we have fitted a heat sink flag to keep the temperature down under these conditions.

Also, the inclusion or otherwise of the 3.3K resistor in series with the zener diode can influence the regulation performance of the unit, particularly at the higher output voltage settings. With the resistor included as shown in the circuit, the regulation will approximate that shown in the curves. Removal of this resistor results in an improvement in the regulation at high voltage and low current settings. However, at high voltage and **high** current settings, the voltage regulation will deteriorate somewhat. This point is mentioned in order that builders of this unit may make this slight alteration if it should suit their particular purpose.

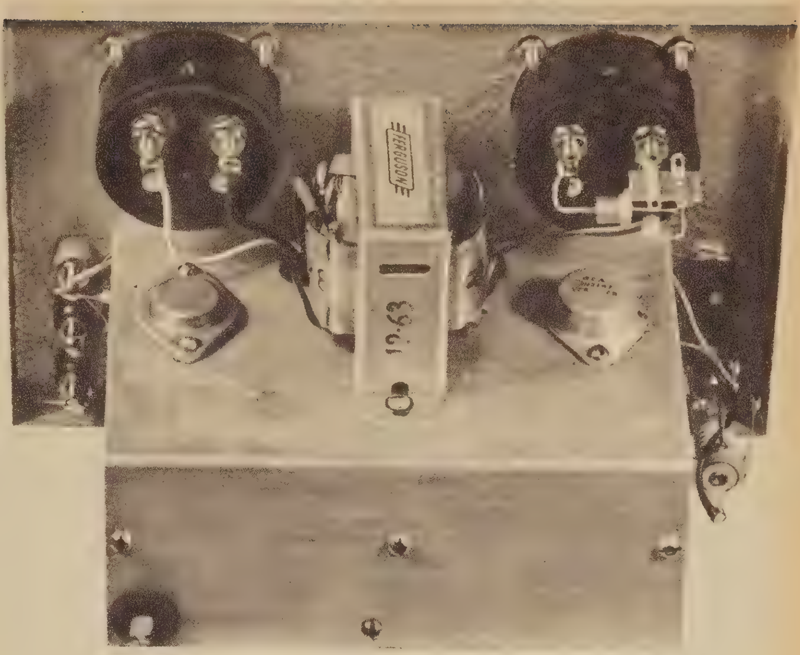
To avoid any possible confusion, we should mention that we have only shown graphs for the 500 milliamp setting of the switch, this being sufficient to give a good idea of the regulation characteristics of the supply.

The complete unit is housed in one of our new small "standard" instrument cases, measuring 7¼ inches by 5 inches by 4 inches. The two small meters are mounted on the front panel, along with the current selector switch and voltage control potentiometer. Two terminals are used to bring out the positive and negative sides of the supply, both sides being left floating. A third terminal between the other two is earthed. As required, either the positive or negative terminal may be strapped to earth.

A chassis 5½ inches by 3¾ inches by 2¼ inches accommodates the rest of the components. The transformer and the two power transistors are mounted on top of the chassis, which is a convenient heat sink for these transistors. Reference to the photographs will show the general placement of components. Layout is not critical but some thought should be given to heat sink efficiency of the power transistors, if any changes are contemplated.

Although the general construction and wiring are fairly straightforward, some comments on this subject may be helpful.

Two grommet holes are provided on the chassis, near the front panel, with one on each side of the transformer. These are conveniently placed to bring the transformer leads under the chassis, as well as for passing other wiring leads through to the meters.



The disposition of the major components is shown here. The voltmeter is on the left, with the current meter on the right. The 2N301 and 2N2147 transistors are on the left and right, respectively. Note the silicon diode on the current meter.

The power transistors should be mounted on the chassis, with due care taken to avoid the possibility of a short circuit between the collector and CHASSIS. All holes should be free of burrs and all trace of metal swarf should be cleared away. The mica washers should be given a thin coating of silicone grease to assist thermal conductivity. The mounting screws must be insulated with a piece of PVC sleeving or other tubing. The length of the tubing should correspond with the additive thickness of the chassis and the transistor mounting lugs. Having mounted the transistors, check that there is no short circuit between the collectors and chassis. Also check that there is, in fact, a circuit between the collectors and the lug provided under the mounting screws.

Before leaving the power transistors, we made use of the fixing screws on each transistor, nearest the back of the chassis, to mount a 3-tag wiring strip. It should be kept in mind that the centre tags will be connected to the respective collectors and not to earth.

Three 3-tag strips are fixed to the back skirt of the chassis to anchor the four electrolytic capacitors. A 10-tag strip is also fixed almost down the centre of the chassis. Among other anchor points, this strip serves to terminate the earth, neutral and active mains leads. By the way, this strip should be mounted before the transformer is screwed down.

When allocating the switch sections, we elected to use those on the right from the rear for the resistors in the emitter of the 2N2147 transistor. The switch section on the left was used for the current metering shunts.

The wiring may be done, all except for the calibrating resistors which are marked with an asterisk on the circuit diagram. These resistors assume the use of meters with 0-1 milliamp movements where relevant, and all values shown are those which were required for our particular unit.

Having wired the supply, with the reservations just mentioned, the next job will be to check the calibration of the output voltage meter. This should be done at 25 volts, normally by reference to another voltmeter of known accuracy. If the meter to be calibrated is a 0-1 milliamp movement, with an internal resistance of 100 ohms, then the series resistor will need to be 24.9K as shown on the circuit. If the meter resistance is other than this value, then the series resistor will have to be adjusted accordingly.

If this checking procedure is to be carried out using the output voltage of the power supply, it will be necessary to have a resistor in the emitter circuit of the 2N2147 transistor to make the supply operative. This could be a resistor of 1 ohm, wired into the 500 milliamp position.

Having calibrated the output voltage meter, the current ranges of the other meter should be done next. Again, this is best done by referring to another meter of known accuracy. To do this, the reference meter should be connected in temporarily between the emitter of the 2N301 and the rotor of S1a. There is a small bleed current due to the voltmeter, the value depending on the output voltage setting.

With the values of shunts given in the circuit, the readings should all come within the tolerance of the resistors used. If it is found that all ranges are reading high, a resistor should be tried in series with the meter, corresponding with the 10-ohm resistor of the circuit. A value should be chosen to bring the readings into line.

At this stage, we should point out that we have only specified ordinary

MAGRATHS BRING YOU 2 *UNIQUE AMPLIFIER DESIGNS* by SINCLAIR

The smallest and most powerful Amplifer ever!

SINCLAIR Z.12 COMBINED AMPLIFIER AND PRE-AMPLIFIER

Sinclair Z.12 universally flexible amplifier is so powerful yet so small. Comes ready built and is very easy to install and use. Z.12 suits any high quality hi-fi system. Its small size and high efficiency make it equally useful for guitar, car radio, P.A. system, etc. Z.12 incorporates its own pre-amplifier to which you add the tone and volume control system of your choice as shown in the Z.12 manual supplied.

TECHNICAL DETAILS

- High fidelity amplifier with pre-amp. and ultra-linear class B output. 8 special H.F. transistors are used in original circuitry to achieve laboratory standards of performance. Generous negative feedback ensures extra good quality.
- FREQUENCY RESPONSE—15 to 50,000 c/s plus/minus 1dB.
- OUTPUT—12 Watts R.M.S. continuous sine wave (24 watts peak) 15 Watts R.M.S. music power (30 watts peak).
- OUTPUT IMPEDANCE—suitable for 3, 7.5 and 15 ohms speakers. Two 3 ohm speakers may be used parallel.
- INPUT—2mV into 2K ohms.
- SIGNAL to NOISE RATIO—better than 60 dB.
- QUIESCENT CURRENT CONSUMPTION—15mA.
- POWER SUPPLY—6 to 20 V.d.c. power unit available or batteries.
- SIZE—3" x 1¾" x ¾".
- WEIGHT—3oz.

BUILT & TESTED **$19.50** **POST FREE** **Anywhere in Aust.**

$15.75 **POWER SUPPLY**

POSTAGE EXTRA

Victoria: 50c
N.S.W., Tas. and S.A.: 75c
Elsewhere in Australia $1.

The most powerful hi-fi Amplifier for its size in the world!

SINCLAIR X-20 INTERGRATED 20 WATT PULSE WITH MODULATED AMPLIFIER AND PRE-AMP

By the use of Pulse Width Modulation in circuitry developed exclusively by Sinclair Radionics, the unique X-20 achieves standards never before reached by any audio amplifier in the world. From the input of the integrated pre-amp. through to the output stage, this amazing amplifier gives quality and power far ahead of anything in its class. Use X-20 like any amplifier, but it uses less space, costs less, behaves perfectly and brings a refreshing new approach to audio. Build it for yourself in the slimmest and most modern styling without heating or ventilation problems.

TECHNICAL DETAILS

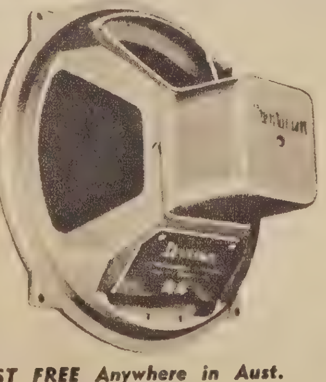
- 12 Transistors.
- OUTPUT stage—silicon epitaxial planars.
- Constant square wave amplitude.
- 95% conversion efficiency at output.
- FREQUENCY RESPONSE — 20 to 20,000 c/s "plus/minus" 1dB.
- TOTAL HARMONIC DISTORTION — 0.1% at 10 watts R.M.S.
- INPUT SENSITIVITY — 1mV into 5K ohms.
- SIGNAL to NOISE RATIO — better than 70dB.
- POWER REQUIREMENTS — 36V d.c.at 700 mA.
- OUTPUT into 7.5 ohms— 15 watts R.M.S. continuous. 20 watts R.M.S. music power.
- OUTPUT into 15 ohms — 10 watts R.M.S. continuous. 15 watts R.M.S. music value.
- Ideal guitar or P.A. amplifier. ● Built-in low-pass filter ensures wide tolerance load at output. ● Add tone and volume control, mono or stereo systems to choice. ● Easily built in an evening.
- Size—8¼in x 3¼in x 1in.
- WEIGHT—ONLY 4½oz.

BUILT & TESTED **$33.50** **POST FREE** **Anywhere in Aust.**
$26.75 Complete Kit and Instructions for building.

$15.75 **POWER SUPPLY**

POSTAGE EXTRA

Victoria: 50c
N.S.W., Tas. and S.A.: 75c
Elsewhere in Australia $1.



POST FREE Anywhere in Aust.

Stentorian SPEAKERS

MODEL. H.F. 1016 STENTORIAN MAJOR. Designed to achieve full range response when mounted in a "compact" cabinet. Fitted with a curved, graded cone with radial and axial stiffenings which provide discontinuities in the surface, reducing "cone breakup" and providing a rigid centre section which forms a high frequency radiator extending the response will into the upper register. This ensures a response free from distracting resonance.
Cone diam. 10in. Pole diam. 1in.. Flux density 16,000 gauss. Total flux 64,000 maxwells. Impedance Coil at 15 ohms. Frequency response 60 c.p.s. to 16,000 c.p.s. in suggested cabinet; 30 c.p.s. to 16,000 c.p.s. in larger cabinet. Capacity 10 watts. **£16/14/** including Sales Tax).

MODEL H.F. 1016 STENTORIAN 10in. P.M. Unit and 16,000 gauss magnet. Universal impedance speech coil at 3, 7.5 and 15 ohms. Capacity 10 watts. Frequency response 30 c.p.s. to 15,000 c.p.s. Bass resonance 35 c.p.s. **£11/17/6** (including Sales Tax).

MODEL H.F. 1012 STENTORIAN 10in. Unit. 12,000 gauss magnet. Universal impedance coil at 3, 7.5 and 15ohms. Capacity 10 watts. Frequency response 30 c.p.s. to 14,000 c.p.s. Bass resonance 35 c.p.s. **£7/10/** (including Sales Tax).
Model T.10 Stentorian Tweeter—Speech coil is aluminium wire wound on an aluminium former rigidly fixed to an aluminium diaphragm. Giving high standard of reproduction when used with Stentorian H.F. 1012 and H.F. 1016 speakers. Speech coil impedance: 15 ohms. Response: 200/15,000 c.p.s. Flux density: 14,000 gauss. Capacity: 5 watts.

J. H. MAGRATH & CO. PTY. LTD.
208 LT. LONSDALE STREET, MELBOURNE, VICTORIA, PHONE 32 3731

5 per cent tolerance resistors, the odd values being made up with two preferred values in parallel. It is felt that 5 per cent accuracy is sufficient here, but if readers so desire, closer tolerance resistors may be fitted.

The actual values of the shunts as shown on the circuit were made up in the following manner: The 0.2 ohm consists of a 0.27 and a 0.82 in parallel. The 0.313 ohm consists of a 0.33 and a 5.6 in parallel. The 0.507 ohm consists of a 0.56 and a 5.6 parallel. The 1.03 ohms consists of a 1.2 and a 6.8 in parallel. Finally, the 3.22 ohms consists of a 3.3 and a 150 in parallel.

Before proceeding further, it will be noticed that we have fitted a silicon diode across the current meter. This was found to be desirable in the event of a sudden short circuit, when set to the 20mA range. Although there is a 100-ohm current limiting resistor in the base to protect the 2N301 from damage as previously explained, the sudden discharge from the 2000uF capacitor causes a high initial current to flow through the meter. The silicon diode reduces the current through the meter to a safe value.

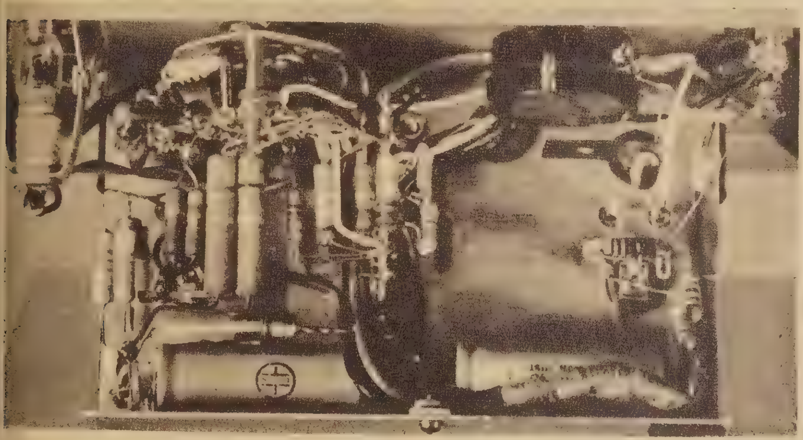
If, during the process of calibration, it is found that the supply will not deliver 500mA, then the 1 ohm resistor temporarily fitted in the emitter circuit of the 2N2147 is too high. In these circumstances, it will be necessary to shunt this resistor with such a value which will permit the supply to deliver the full current of 500mA. In our case, the shunt resistor across 1 ohm turned out to be 8.2 ohms.

For this purpose of calibration, it will be necessary to provide some sort of adjustable load, so that the necessary current will be drawn from the supply. Adjustable wire wound resistors are ideal for this purpose. In any case, provision of a suitable load must be left to the ndividual. However, the task is made a ittle easier as far as the exact load resistance is concerned, by the fact that t does not matter where the voltage output level is set and this can sometimes be juggled to obtain the correct current hrough the load resistance available.

In cases where no reference meter is available, either for the voltage or current meter calibrations, provided the full cale current and the internal resistance of the meters are known, the best that can be done in the circumstances is to use the values of resistance as recommended. These should be fitted and any inaccuracies accepted.

With the calibration of the current meter complete, the reference meter may be removed and the newly calibrated meter may be used for the next job, that of arriving at the correct resistor values for the overload protection circuit.

As mentioned previously, the value for each of these resistances will depend on the characteristics of the silicon diode used. Perhaps it may not be realised, but the 500 milliamp range has virtually been done. Unless the load used to arrive at this figure was closely approaching a short circuit, then it would be wise to check this range before proceeding further. Short circuit the output and the current meter should just read full scale. Adjustment of the shunt resistance across the 1 ohm resistor should be made if necessary.



This underneath view shows the placement of the electrolytics on the rear skirt, two on each side. The selector switch and resistors are on the top left, with the voltage setting potentiometer on the right.

To adjust the 200mA range, set the switch to this range. A resistor or combination of resistors must be fitted, so that on a short circuit of the output, the meter reads the full scale value of 200mA. Using our case as a guide only, we needed a 1.5 ohms in parallel with 5.6 ohms.

A similar procedure is adopted for the 100mA and 50mA ranges. In each case, set the switch to the appropriate range. Again referring to our unit, we found that a resistance of 3.9 ohms was needed for the 100mA range. On the 50mA range, we used a resistance of 8.2 ohms.

The two meters which we used were supplied with scales calibrated 0-1 milliamp. We left the current meter scale as it was received and the ranges can be allowed for mentally, without any difficulty. On the other hand, we removed the scale from the voltmeter and recalibrated it by hand to read 0-25 volts. The unwanted markings were carefully removed with a razor blade and the new markings filled in with a pen and india ink.

This completes the calibrations and adjustment and the Protected Transistor Power Supply is now ready for service. No doubt, such a piece of equipment will prove to be invaluable in the workshops of servicemen and many others. ■

DEITRON
ELECTRONICS
MAIL ORDER SPECIALISTS
P. O. BOX 86, BROADWAY, N.S.W.

MINIATURE ELECTROLYTIC
AND POLYESTER CAPACITORS
WRITE FOR CATALOGUE
TRADE INQUIRIES WELCOME

TRANSISTORISED VARIABLE
D.C. POWER SUPPLY
0-20 volts variable. 200 mA. Max. current.
$19.50
75c postage.

MINI-LAB 7 in 1 MULTIMETER
Resistance Substitution. ½W., 5%, 100, 1K, 10K, 100K, 1 megohm. Capacitance Substitution: .002, .005, .02, .1(oil600v) and 10uf. R.F. Signal Generator: 455kc, at 35mV. Audio Generator: 400c/s (approx.) 35mV. DC and AC Volt ranges: 0-15, 0-50, 0-150, 0-500. R.F. Field strength: 1-140mc. Antenna: 5 section 10¾in. Sizes: 6in x 2¾in x 3⅜in. Battery operated.
COMPLETE $18.75.
Post 50c, interstate 75c.

TRANSISTORISED SIGNAL INJECTOR
2 Tarnsistor, Osc. Voltage 1.5 to 2v. P-P Freq. 400-700cps. plus harmonics.
Price $5.28, Post Free.

TRANSISTORISED SIGNAL TRACER
Gain: over 70dB. Gain control: continuous from 0. Attentuation factor: 0-20-40-60. Input Impedance: AF: over 70Kohm, R.F.: over 100Kohm. Output Impedance: ext. speaker, 8 ohm output,600 ohm unbalanced. Meter: VU 200uA Speaker: 2¼in dynamic. Contains 6 Transistors, 4 diodes, 1 thermistor. Size: 5⅞in x 3⅜in x 2¾in. Battery: 9V, 006P.
$27.05
Complete
Post 50c, interstate 75c.

We have the facilitics and spares to service all instruments advertised by us. All inquiries P.O. Box 86, Broadway, N.S.W.

WRITE TODAY TO BE PLACED ON OUR MAILING LIST OF NEW INSTRUMENTS and COMPONENTS

PRECISION ELECTROACOUSTIC EQUIPMENT

RCF

TRUMPETS

HD. 210/P

Low frequency cut-off	350 Hz
Sound distribution	120 deg
Air column length	350 mms
Power rating	6 watts
Watts peak	15 watts
Impedance	16 ohms
Frequency response	350 ÷ 10000 Hz
Maximum diameter	210 mms.
Maximum length	210 mms.
Weight	1,300 grs.

Price Retail £12-16-0
Plus Sales Tax £1-6-8

H. 300

Low frequency cut-off	220 Hz	Watts peak	35 watts
Sound distribution	90 deg.	Voice coil impedance	16 ohms
Air column length	550 mms.	Frequency response	120-7,000 Hz
Maximum diameter	315 mms.	Maximum diameter	82 mms.
Maximum length	365 mms.	Maximum height	68 mms.
Weight	1,500 kgs.	Weight	1020 grs.
Power rating	18 watts	Complete with accessories for application for line transformer.	

Price Retail £19-5-0
Plus Sales Tax £2-8-1

H. 450/5

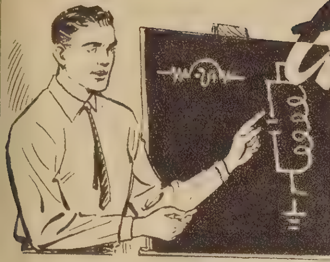
Low frequency cut-off	150 Hz	Power rating	25 watt
Sound distribution	85 deg.	Watts peak	45 watt
Air Column length	915 mms.	Voice coil impedance	16 ohm
Maximum diameter	445 mms.	Built-in line matching transformer 16—165—250—500—1000 2000—3000 ohms	
Maximum length	540 mms.	Frequency response	80-12,000 H
Weight	4 kgs.	Watertight construction	
		Equalised compression system	
		Maximum diameter	110 mm
		Maximum height	150 mm
		Weight	2180 gr

It may be supplied also without cover-hood for fitting the driver unit model 2545 TS.

Price Retail £37-1-0
Plus Sales Tax £4-12-8

ZEPHYR

ZEPHYR PRODUCTS PTY. LTD.
58 HIGH STREET, GLEN IRIS, S.E.6, VICTORIA
MANUFACTURERS OF RADIO & ELECTRICAL EQUIPMENT & COMPONENTS



the "Answer Man" Explains

Why not a TV sound-only tuner?

During recent months there have been references in the Correspondence column to the provision of a tuner or receiver for television sound only. The "Answer Man" has been faced squarely with the issue . . . . What's the problem?

I refer to the references in your columns to people wanting tuners to get television sound only. What's the difficulty about such a proposition? Surely it should be simple enough?

If people want to listen to television sound on a casual or a curiosity basis only, something like our "Fremodyne Four" (Sept., Oct. and Nov., 1962) would be adequate. While a fairly modest set, the TV stations can nevertheless be heard, along the with a lot of other signals distributed over the VHF spectrum.

However, most people who ask for television sound-only tuners appear to be high-fidelity conscious and either want to listen to the recorded music during test card transmissions, or to tape the music for listening at other times. Their interest is not in an "experimenter" type set but in something where quality is paramount.

Now come the problems. Television stations in Australia occupy thirteen channels, from 45 to 222MC inclusive, representing a tuning range of about 5:1, scattered across the VHF spectrum.

The first is that you can't go into a radio shop and buy a kit of components, which will tune across this range of frequencies. The idea of stringing together a tuning gang, a set of coils and perhaps a wavechange switch, as for the broadcast and short-wave bands, doesn't work out at VHF. To be sure, tuning systems have been devised overseas, using the variable inductor principle, but the demand for them is so small that they are quite rare.

The only kind of tuner which an experimenter could consider would be a regular television type, which he would presumably have to modify to work into a different IF system. But this is not the end of the story.

The second major problem has to do with frequency stability. When an FM signal is tuned directly and heterodyned down to pass through, say, a 10.7MC IF system and discriminator, the quality depends very heavily upon accuracy of tuning and the ability of the receiver to hold that tuning. If the receiver is mistuned to begin with, or if it drifts after the initial setting, the distortion level can become quite appalling.

Regular FM tuners, which are required to tune only a relatively narrow portion of the VHF spectrum around 90MC, have to be designed with special attention to frequency stability and, in some cases, are fitted for automatic frequency control.

In television receivers, oscillator drift is not nearly so urgent a problem, because relatively large variations in the resultant picture signal IF have only a minor effect on picture quality. As a component therefore, television tuners do not need to exhibit the stability one would expect from an FM tuning system. Whether they could be adapted for the purpose, as mentioned earlier, would have to be demonstrated in practice but it is not hard to foresee immediate problems with the usually rather sloppy oscillator slugs.

Trouble from the sound system by reason of oscillator drift is obviated in Australian television receivers by the intercarrier system of reception.

In this system, the tuner and IF system receive picture and sound carriers simultaneously, their IF resultants producing an "intercarrier" beat of 5.5MC at the video detector. This resultant beat signal, still carrying the FM signal component, is amplified and demodulated in a separate 5.5MC IF system, fed from the video detector or amplifier.

Drift in the receiver oscillator is of little consequence because the 5.5MC beat is as stable as the two very precise carriers which produce it and the major requirement in the receiver is the relatively modest one that the discriminator transformer holds its adjustment.

The system works so well that by far the easiest way to produce a television sound-tuner is to assemble a television turret tuner, a 30MC video IF strip, a 5.5MC sound IF strip and a video amplifier stage, where such a stage is involved in the IF chain.

To be sure, this constitutes the entire front end of a television receiver and, if the audio system and a power supply are provided, it adds up to a television receiver, minus the picture tube and its attendant circuitry. But the fact is that this is probably the easiest and cheapest way of meeting the requirements. The resourceful hobbyist, for example, may well put together a workable sound receiver from "clearance" stocks of tuners and IF strips or salvage the required sections from an otherwise unserviceable television set.

But why go to all this trouble, when there are perhaps two television receivers in the house already?

A very good question. Why?

In fact, the output from the discriminator of an ordinary television receiver is likely to conform to high fidelity requirements and should meet the needs of a tape recording as is. If the glowing screen bothers you, turn down the brightness.

So there it is. Strange as it may seem, the simplest way to hear the program from any desired television station is to provide yourself with a television set, minus the picture tube and circuits. The alternative? Drive yourself silly trying to buy or build a full coverage VHF tuner and then (if you ever get one) face up to the problems of getting it drift-free or fully compensated by automatic frequency control.

ALWAYS RELY ON R.D.S.

HI-FI SPECIAL FOR
APRIL

Using:—

R D S

1—Star SA30 Amplifier complete—12 watts per channel—Frequency response 50—50,000 cps ± 1 db at 12 watts

2—Slimline Teak Cabinets fitted with 8mx speakers

1—AT6 Garrard Changer Player fitted with 105 Ronette cartridge.

Price for complete system including sales tax £98/19/6 $197.95

Teak Base optional Extra £3/10/0 $7

Suppliers of all Radio and TV Components — Meter and Multimeters.

H200 Multimeter £5/12/6 Nett $11.25

CT500 Multimeter £6/9/4 Nett $12.93

The Independent Wholesaler
RADIO DESPATCH SERVICE,
Radio and Electrical distributors,
Cnr. George and Harris Streets,
869 GEORGE STREET, SYDNEY.
Phone 211-0816, 211-0191.
Open Saturday mornings.

Tested, off-the-shelf amplifiers for any application

Newmarket pre-assembled Packaged Circuit Amplifiers have been developed to provide standardised starting points in the design of all types of equipment in which amplifiers fulfil a major role. Six are at present available from stock and others are in course of development. Their use saves expensive, time-consuming research, thus cheapening the production of new types of electronic equipment.

Recently released is the PC9 impedance matching A.F. pre-amplifier. It has been specifically designed to enable a high impedance capacitive source to be fed into the relatively low impedance amplifiers PC2, PC3, PC5 and PC7+. An abridged specification is listed below.

SUPPLY VOLTAGE: 9V.
INPUT IMPEDANCE: Typically 600 ohms.
FREQUENCY RESPONSE: Flat from 20 cps to 20 kc/s (± 3db) at 1 kc/s level.
SIZE: 1.4" x 1.25" x .5". WEIGHT: 7 grams. **Price: £3/5/-**

SPECIFICATION DETAILS

A typical miniature Audio-Amplifier is illustrated actual size above. Circuits are of transformerless, complementary symmetry type, operating off Standard Voltages. Can be wire-in or plug-in as required.

PERFORMANCE DATA	PC1	PC2	PC3	PC4	PC5+	PC7+
Power Output (RMS)	150mW	400mW	400mW	400mW	3W	0.8W
Input Sensitivity (Full output)	100mV	2mV	10mV	200mV	5mV	5mV
Input Impedance (Typical)	1.5K	1K	2.5K	220K	1.5K	1.5K
Load Resistance (Ohms)	40	15	15	15	3	8
Supply Voltage (Nominal)	9V	9V	9V	9V	12V	9V
Total Distortion (Full output)	6%	6%	6%	6%	3%	3%
Frequency Response	330 c/s —15Kc/s	200 c/s —12Kc/s	200 c/s —12Kc/s	200 c/s —12Kc/s	50 c/s —15Kc/s	50 c/s —15Kc/s
Overall Dimensions (Inches) All ¾in. high.	2 x 1	2½ x 1½	2½ x 1½	2½ x 1½	5½ x 1¾	3 x 1¾
PRICE	£3/2/6	£3/15/	£3/15/	£3/15/	£8	£4/15/

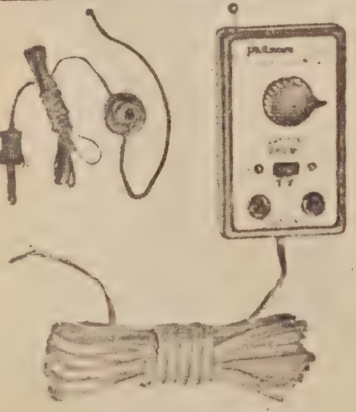
MODEL No. PC 1
Stethoscope Amplifier.
General Purpose Audio Amplifiers and Drivers.
Intercomm Amplifier.
Telephone Amplifiers.
Laboratory Instrument Amplifiers.
Back Projector Audio Amplifiers.
Loudspeaker Amplifier.
Hospital Board Control Units Intercomm Amplifiers.

MODEL No. PC 2
Modulator Driver Stage.
Intercomm.
Church Hearing Aid Amplifier.
Office Dictating Machines.
Door-Caller Monitor Amplifier.
Inter-Office Communication Amplifier.
Tape Replay Amplifier.
General Purpose Audio Amplifiers and Drivers.
Telemetry Audio Amplifier.
Radio Receiver Audio Amplifier.
Telephone Amplifiers.
Educational Equipment Audio Amplifiers.
Laboratory Instrument Amplifiers.
Language Laboratory Amplifiers.
Tape Recording Amplifiers.
TV Aerial Riggers Intercomm Amplifier.
Loudspeaker Amplifier.
Radio Concentrator.
Mine Communication Amplifier.

MODEL No. PC 3
Disc Talking Book.
DC Relay Driver.
Telecommunications Conference Monitor Amplifier.
Sound-level Meter Amplifier.
Close Background Music Amplifier.
Sound Reinforcement Amplifier.
General Purpose Audio Amplifiers and Drivers.
Low Power Battery Stereo.
VHF Communications Receiver Audio Amplifier.
Radio Receiver Audio Amplifier.
Radio Relay System Amplifier.
Loudspeaker Amplifier.

MODEL No. PC 4
Battery Record Player.
General Purpose Amplifiers and Drivers.
Office Dictating Machines.
Telephone Amplifiers.
Pay TV Control Circuits Amplifier.
Stereo Listening Booth Amplifiers.
Laboratory Instruments Amplifiers.

MODEL No. PC 5 Plus
Salesman's Portable Cine Projector Audio Amp.
Meter Type Galvanometer Amplifier.
Helmet Intercomms: (a) Diving Suits, (b) Crash Helmets, (c) Pilots' Helmets.
Car Radio Audio Amplifier.
Communications Receiver Audio Amplifier.
Lecturer Non-interruption Monitor.
Erotogenic Amplifier.
Small public Address Portable Amplifier.
Servo Amplifier (Hydraulic valve control).
General Purpose Amplifier.
Fault Finding Tone Detector Amplifier.
Tape Replay Amplifier (Aircraft ground equipment).
Automation Drive Amplifiers.
Colour Television Receiver Audio Amplifier.
Tape Recorder Replay Amplifier.
Hi-Fi Amplifier.
Vibration Test Amplifiers.
Mines Telephones Amplifiers.
Cigarette Manufacturer Production Test Equipment Amp.



Private Radio-TV listener with
REMOTE VOLUME CONTROL

Housed in compact plastic cabinet (size 2 7/8in x 1¾in x 1 3/16in), incorporating a speaker on-off switch and built-in remote volume control for convenient listening.

Simple to attach on any make TV, Radio, FM. Phonograph or Hi-Fi sets. Does not interfere with the normal operation of the set. Supplied with 20ft of cable and miniature earphone with plastic-covered wire ear-holder. Has built-in extra jack for additional person to listen.

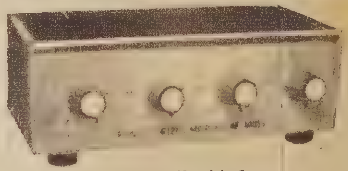
Net Price 42/- ea.

TRANSISTOR MEGAPHONE

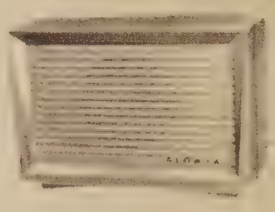
Miniature and handy. Can be used anywhere by anybody. Megapet PM-77 Transistor Megaphone . . . Transistors: 3 pcs. Battery: Dry Cell (UM-)3 8 pcs. Acoustic Range: 100 metres. Height: 98 mm. Width 68 mm. Overall length: 170 mm. Weight: 550 g. (with batteries).

Price £9/9/

Please Note: Clarence St., City, and Liverpool Stores are Open Saturday Mornings.



MODEL M-6
Monaural Microphone Mixer
Price £3/7/6



MODEL SB-401
PLASTIC CABINET
Complete with 4in speaker.
Price £3/-/-

GENERAL ACCESSORIES

Trade Enquiries Invite

116-118 Clarence Street, Sydney. BX-4451
443 Concord Road, Rhodes. 73-0211
102 Northumberland Street, Liverpool, 602-7570.
7 Pirie Street, Fyshwick, A.C.T. 90035

Incidentally, some months ago, we came upon our assistant editor, Philip Watson, "doodling" block diagrams over his desk pad. It transpired that he was dreaming up a modified inter-carrier system in which a crystal oscillator in the receiver was used to replace the picture carrier, or something to that effect. It rapidly became apparent that the parts introduced to save costs would probably be more expensive that the parts eliminated!

Faced with these difficulties, many potential constructors may well lose some of their enthusiasm. But, in any case, it is well to work out how much real use a sound-only tuner would get. At the time when most people would be able to listen, the loudspeaker would be pouring forth the usual cacophony of screams and shots with no clues as to who was getting theirs and for what reason.

It is apparently possible to buy or build units which will operate transistor radios and tape recorders from the 240V AC power mains. I can't seem to locate a unit which will operate radios and recorders from the supplies commonly available in boats, cars and country homes, namely 6, 12, 24 and 32 volts. Why not, when some tape recorders have built in provision for external supply?

In answering your question, it is necessary to stress that a power supply unit to substitute for batteries has to satisfy a number of important requirements:

(1) It must be free of 50 or 100cps hum from the AC mains, where these are the source of power. This involves generous filtering in the form of one or more filter chokes, large value capacitors and/or a "dynamic" filter system, whereby a transistor is used to supplement the smoothing action of the other filter components.

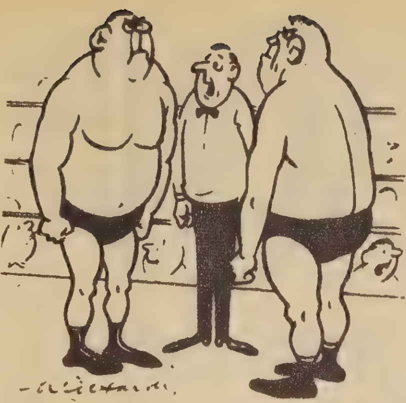
(2) It must have a suitably low output impedance, as far as audio or other signal currents are concerned. Failure to satisfy this requirement can promote instability effects in an amplifier system fed from it.

(3) It must be able to supply the required amount of load current. Higher orders of load current call for more generously rated components throughout the supply, usually adding up to increased size, weight and cost.

(4) It must provide the required order of voltage or something very close to it, under a variety of load conditions. The voltage must not rise unduly, with very small orders of load current, nor fall away too steeply with higher orders of load current. In short, its voltage regulation must be fairly good.

(5) It should be reasonably self-protecting in the event of a brief, accidental short-circuit. A supply which does not have this feature can be a costly proposition if an accidental short ruins an internal rectifier or control transistor.

This list of requirements may seem rather imposing but it only parallels the qualities of the humble battery which the supply is intended to replace: A battery has no hum content, has a relatively low output impedance, can normally supply the currents required of it, provides reasonably good voltage regulation over the intended load range and is tolerant to a momentary short circuit.



Now shake hands. Go to your corner and, on the bell, come out miming! (TV Times)

The measures necessary to satisfy these basic requirements explain the complication and cost of power supply units, designed to substitute for batteries.

Supply units which are designed to operate with a particular piece of equipment generally present fewer difficulties than "universal" supplies. The designer knows beforehand the exact range of current likely to be drawn, the tolerance of the equipment to over or under-voltage and to supply internal impedance, and the amount of hum reduction that has to be achieved. He may also be able to arrange the interconnections to obviate, for all practical purposes, risk of a momentary short-circuit.

And while it doesn't follow that the requirements will always be easy to meet, the designer does not need to go beyond them.

The assignment becomes a lot tougher if the designer has to produce a unit which must exhibit a hum level and output impedance low enough for all conceivable applications, along with good voltage regulation under a wide range of current load and self-protection against careless use.

If the requirement is added of exhibiting these characteristics for a variety of selectable voltages as well the going really gets tough.

Nevertheless, the demand for AC supplies to operate transistorised equipment is sufficiently great to have prompted the marketing of quite a few ready-made units and the publication of do-it-yourself articles. In our own case, reference can be made to the issues of April 1962, July 1963, February 1963, November 1964 and December 1965.

When it comes to operating transistors from existing DC supply sources, all the requirements previously listed must still be met, with the possible qualification that the 50 or 100-cycle filtering has to be re-directed towards any "commutation" product that may be present, using the term in its widest sense.

Where transistor equipment has to be operated from a DC supply which is higher than specified, a seemingly obvious course is to insert a dropping resistor in the line. There arises the problem, however, that voltage drop across such a resistor is dependent on the load current through it and it is

Every Switch-user wants

ABSOLUTE RELIABILITY

RELIABILITY has been carefully built-in to this wide-range of OAK, CUTLER-HAMMER, NSF and other world-renowned designs

More than 1,000 types available. Write for details of Rotary, push-button, piano-key, lever types, tool handle, push-push, slide, rocker, automotive, industrial and service approved types to:—

SYDNEY: Electronic Parts Pty. Ltd., 32 Wardell Road, Petersham. Phone 560 7566, and all recognised wholesalers. **MELBOURNE:** Amalgamated Wireless (Australasia) Ltd., 167 Queen Street. Phone 67 9161. **HOBART:** Amalgamated Wireless (Australasia) Ltd., 123 Murray Street. Phone 3 3836. **LAUNCESTON:** Amalgamated Wireless (Australasia) Ltd., 80 Cameron Street. Phone 2 1804. **ADELAIDE:** Newton McLaren Ltd., Leigh Street. Phone 51 0111. **BRISBANE:** Chandlers Ltd., Albert and Charlotte Streets. Phone 31 0341. **PERTH:** Amalgamated Wireless (Australasia) Ltd., 335 William Street. Phone 28 3425.

MANUFACTURERS SPECIAL PRODUCTS PTY. LTD.
47 YORK STREET, SYDNEY. 2 0233

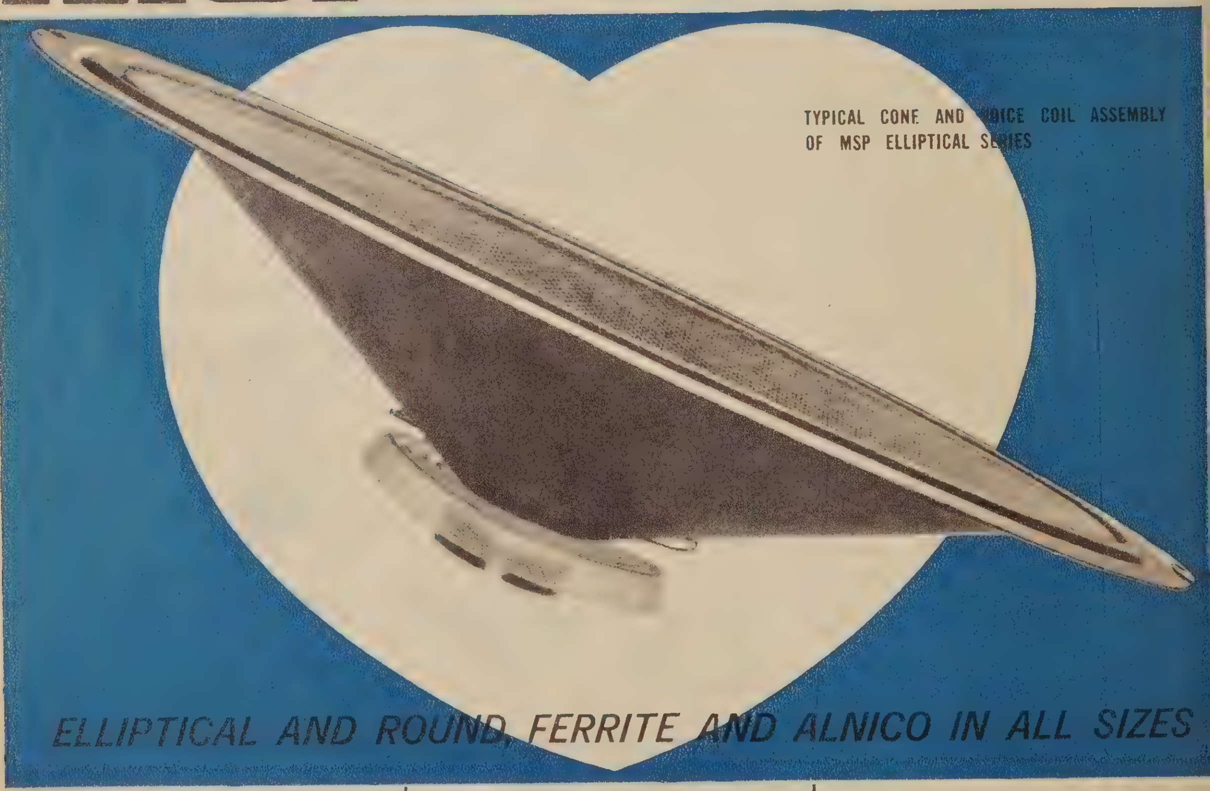
M488

MSP2-64

The CONE

is the HEART of your

MSP HI-FLUX SPEAKER



TYPICAL CONE AND VOICE COIL ASSEMBLY OF MSP ELLIPTICAL SERIES

ELLIPTICAL AND ROUND, FERRITE AND ALNICO IN ALL SIZES

Kid gloves are not good enough for the handling of this **key** component of every MSP Hi-Flux Speaker — from the moment the **cone** is formed it is treated with meticulous care as it proceeds through an exacting series of tests and inspections. But the greatest care of all begins at the design stage when the exact cone shape and rim configuration are determined. Then comes the choice and blending of fibrous pulps for the sound characteristics to be achieved — next to be decided is the most suitable beating cycle which will turn the mix into the exact form required — then follows the decisive cone forming operation — but perhaps enough has been said already to convince you that MSP speaker cone design and manufacturing techniques are important reasons why this range has become **first choice in Australia.**

M SP

MANUFACTURERS SPECIAL PRODUCTS PTY. LTD.
47 YORK STREET, SYDNEY – 2 0233

quite wrong to assume that a particular resistor will drop a 12-volt supply to, say, 9 volts.

Quite apart from the accuracy or otherwise of the voltage drop, the presence of a resistor in the supply line may raise the effective impedance of the supply source to a point which will cause malfunction of the equipment connected to it. This may necessitate the provision of a large value electrolytic capacitor across the low voltage end of the supply.

A still further point which needs to be watched is that many DC supply lines are "grounded." For example, auto electrical systems are invariably grounded to the chassis of the vehicle, the polarity varying from one type of vehicle to another. Similarly, 32-volt lighting plants are normally earthed as a precaution against radio interference.

When connecting transistorised equipment to such sources it is essential to see that the "earthy" metalwork or ground connection of the equipment does not conflict with the supply earth resulting in a short-circuit across the supply, or across any dropping resistor that may thoughtfully have been installed.

Once again, the problems are minimised when the provision has to cover one particular piece of equipment, because the designer knows the current drain of the transistor equipment, its tolerance to voltage variations, the risk of wrong polarity connection, the risk of short-circuits and so on.

It is a very different matter to provide for any piece of transistor equipment that might come to hand.

And what about the reverse situation, when there is a requirement to operate, say, 9-volt transistor equipment from a 6-volt supply?

To step up DC, one can use a motor-generator, a vibrator/transformer/rectifier system or a transistorised chopper/transformer/rectifier system, all of which add up to quite a bit of complication—much more, in fact, than an AC mains supply.

Because of these problems, and the limited demand for DC supply adaptors (at the price they would have to be) such devices are rare—and likely to remain so.

The idea of a DC adaptor which gives any kind of DC "out" for any kind of DC "in" is not impossible of solution — just thoroughly impractical!

Can a transistor radio with ferrite aerial be used with a short-wave converter?

The answer is "YES, but . . ."

Most transistor radios, including the one you apparently have in mind, have a ferrite rod type aerial which is in use at all times for reception on the broadcast band. Some have provision for the connection of an external aerial and earth, but many do not.

Where there is such provision, the chances are that the external aerial and earth terminals connect to the respective ends of a small supplementary winding around the ferrite rod. In the usual way, the output from a short-wave converter can be connected into these terminals.

Where no such terminals are provided, there comes the problem of coupling the converter output to the ferrite rod aerial. In some cases it is possible to add a supplementary winding yourself by looping about 3 or 4 turns of thin plastic-covered wire around the rod. Considerable care is necessary when adding such winding to avoid stressing the rod and possibly breaking it or fracturing other fine wires in the vicinity.

The ends of the winding can be held together by passing them through a short sleeve of plastic tubing and bringing them out of the receiver case in any way you can devise.

Where space prohibits the addition of such a winding, we have heard of experimenters who have achieved successful coupling to the ferrite rod by winding a few turns of plastic covered wire around the outside of the cabinet. The winding should be around the cabinet in such a way that the ferrite rod passes through it.

Yet another scheme we have heard about involves feeding the output of the converter to a winding on a ferrite rod, which is then mounted in some way end-to-end with the receiver ferrite rod and as close to it as possible. The winding on the extra rod may be resonated—by using a regular loopstick aerial coil resonated by a trimmer—or it may be a low impedance winding of a few turns, fed from a low impedance winding on the converter output coil.

By one or other of such means it is possible to effect coupling between the short-wave converter and the transistor receiver, but the problem remains that the ferrite aerial is fully active in picking up broadcasting stations, as well as the output of the short-wave converter.

The problem then becomes one of finding a spot on the band which is reasonably free from strong broadcast signals. This may not be too difficult in daylight hours, but may be a major problem at night, when broadcast stations romp in from everywhere. Note that you may be able to use the directivity of the ferrite rod antenna to minimise signal pickup from interfering stations.

Now you see why we began our answer with the phrase, "Yes, but . . ." ■

BEHIND THIS SYMBOL

. . . a versatile range of TRIMAX products

- GAIN CONTROLS
- POWER SUPPLIES
- AUDIO TRANSFORMERS
- VOLTAGE REGULATORS
- POWER TRANSFORMERS
- PRECISION SHEET METAL
- ELECTRONIC EQUIPMENT
- INSTRUMENT TRANSFORMERS
- TELECOMMUNICATION EQUIPMENT

L M ERICSSON PTY. LTD.
"TRIMAX" DIVISION
FACTORY -
CNR WILLIAMS RD & CHARLES ST NTH COBURG VIC
PHONE 35 1203 - TELEGRAPHIC ADDRESS TRIMAX MELB

HI FI AT ITS FINEST

sinclair X-20
PULSE-WIDTH MODULATED AMPLIFIER AND PRE-AMP

THE MOST ADVANCED HI-FI AMPLIFIER IN THE WORLD

BRIEF SINCLAIR X-20 SPECIFICATIONS

Number of Transistors — 12.
Overall Size—8¼" x 3¼" x 1"
Weight—4½ ozs.
Total harmonic distortion—less than 0.1% at 10-W.
Output power into 7.5 or 8 ohm speaker.
20 Watts R.M.S. music power.
15 Watts R.M.S. continuous.
Output power into 15 ohm speaker.
15 Watts R.M.S. music power.
12 Watts R.M.S. continuous.
Supply voltage (battery operated)—
28 to 37 volts (7.5 ohm speaker).
28 to 45 volts (15 ohm speaker).

Send now for full technical details and literature or order now.

Made-up Form .... $26.50 plus sales tax

Kit Form .... $21.50 plus sales tax

Power Supply for 230-volt operation to suit above. $12.60 plus sales tax

CENTRAL IMPORTS
34 JAMES STREET, PERTH, WESTERN AUSTRALIA
IMPORT AGENT — DISTRIBUTORS, TELEPHONE 28-1212
Wholesale enquiries welcomed

Taylor METERS

68 RANGES—OVERLOAD CUT-OUT

0-10 AMPS 0-2500V AC & DC.

This is a very robust multimeter which will measure both AC and DC voltage and current, db, output, capacity and inductance, also resistance, to 50 megs. The 88B is fitted with a resettable overload cut-out, also a reverse polarity facility. The Taylor centre pole meter has an anti-parallax scale which is calibrated in three colours.

A high-quality leather case (optional extra) is available for protection during transport.

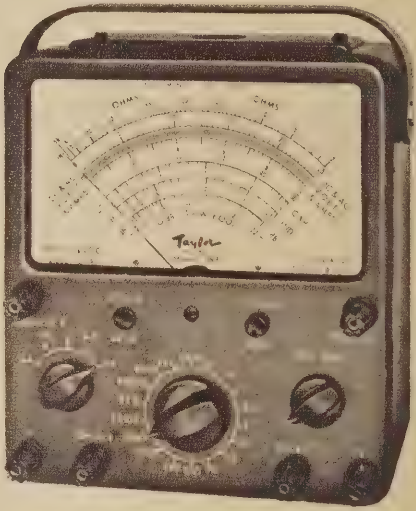
SPECIFICATIONS

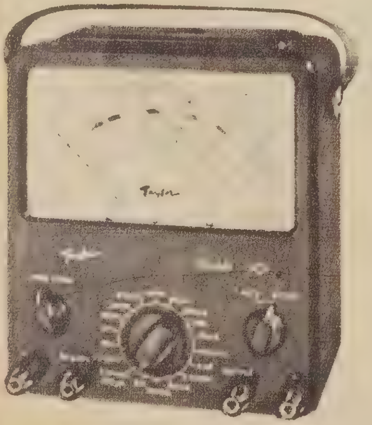
Sensitivity	DC: 20,000 opv; AC: 2,000 opv.
Accuracy	DC: 2 per cent. AC: 3 per cent.
Volts	DC: 0-2500 (13 ranges), 25KV with probe (extra). AC: 0-2500 (11 ranges).
Current	DC: 0-1000mA (13 ranges). AC: 1-1000mA (9 ranges), AC and DC: 0-10A.
Resistance	1 ohm-50 megs. (5 ranges).
Output	As in AC ranges.
Capacity	1000pF-100uF (4 ranges).
Inductance	0.2-20H (2 ranges).
DB	—10 to +68 (9 ranges), 0=1mW in 600 ohms).

88B MULTIMETER

PRICE $79.50

Plus Tax at 12½ per cent for Sydney
Slightly Higher Interstate





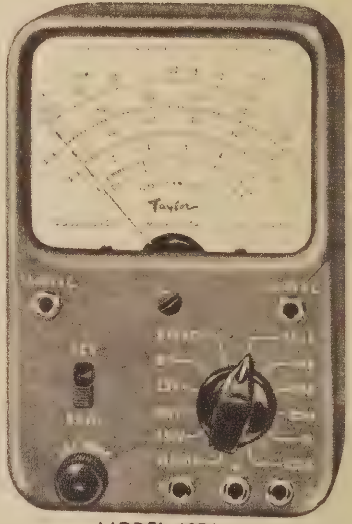
MODEL 101
PRICE $63.50
Plus Tax at 12½ per cent
F.O.R. SYDNEY
Slightly higher Interstate

MODEL 101

Sensitivity	DC: 100,000 opv AC: 5,000 opv
Accuracy	DC: 2%: AC: 3%
Volts	DC:0—1,000 (7 ranges) 25KV with probe (extra) AC: 0—1,000 (5ranges)
Current	DC: 0—250uA (3 ranges) 0—1000mA (2 ranges) 0—10 amps (2 ranges)
Ohms	0—200 megs (4 ranges)
Db	—10 to +62db (5 ranges)
Output	0—1000V (5 ranges)
Scale	5" anti-parallax 3 colour
Extras	Leather carrying case
Size: Weight	8¼" x 7½" x 4½ — 4¼lbs

MODEL 127A

Sensitivity	DC—20,000 opv. AC—1,000 opv.
Accuracy	DC:—3% FSD: AC—4% FSD
Volts	DC:0—1,000 (7 ranges) 25KV with probe (extra) AC:0—1,000 (5 ranges)
DC Current	50/uA—100/mA (4 ranges) Shunts to 10A available
Resistance	0—20 megs (3 ranges)
DB	—10 to + 62 db (5 ranges)
Weight: Size	1 lb: 5¾" x 3¾" x 1¾"



MODEL 127A
Price $31.50
Plus Tax at 12½ per cent
F.O.R. SYDNEY
Slightly higher Interstate

JACOBY, MITCHELL & Co. Pty. Ltd.

469-475 KENT STREET, SYDNEY (26-2651)

MELBOURNE:
15 ABBOTSFORD ST.,
NTH. MELBOURNE.
(30-2491-2)

ADELAIDE:
372A SOUTH ROAD,
GLANDORE. (53-6117)

BRISBANE AGENTS:
T. H. MARTIN P./L.,
WILSON HOUSE,
CHARLOTTE ST.
(2-1785)

PERTH AGENTS:
C. F. LIDDELOW & CO.,
252 WILLIAM ST.,
PERTH. (28-1102)

TASMANIA AGENTS:
K. W. McCULLOCH P./L.,
P.O. BOX 606G
LAUNCESTON (2-5322)

A READER BUILT IT!

Circuits and devices which we have not actually tested in our laboratory but published for the general interest of beginners and experimenters.

Solution for an electronics puzzle

A.K. (Marrickville, N.S.W.) forwards a simple circuit for an electronic puzzle used in a recent DCA Training School display.

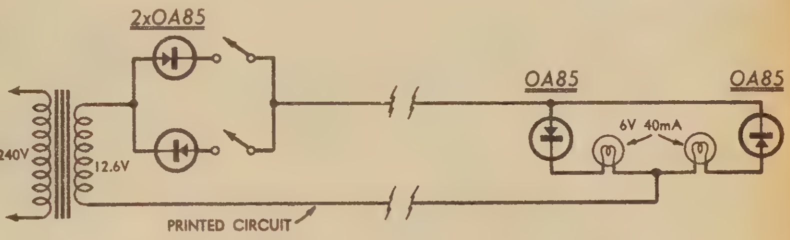
The circuit mentioned was one in which two light bulbs on a remote head could be individually controlled by two switches on a control unit, although there appeared to be only one conductor between the two sections. The problem posed was "How is this possible?" Even assuming that there were in fact two conductors (as was in fact the case, the second conductor being carefully camouflaged) this still does not explain how two lights can be controlled via one pair of leads.

The circuit used is quite a common one, using four diodes, two for each unit, and an AC supply. The lamps operate independently from different half-waves of input voltage, through their respective switches and diode pairs. The only point to be resolved is the whereabouts of the second conductor.

Our correspondent says: "The device was built in two separate units, comprising lights and switches, and only one visible conductor between them. The base was actually a printed circuit board, all etched except for a 1/16th inch strip along one edge, and this provided the other conductor. Two ¼in Bakelite strips served as feet, one of which hid the copper strip.

"The two boxes on which the lights and switches were mounted matched the width of the board, so connection to the strip consisted merely of two nails through the board and soldered to the strip. Floating leads were soldered to the nails and thence to the appropriate tag strip. The boxes were fixed to the board with self-tappers.

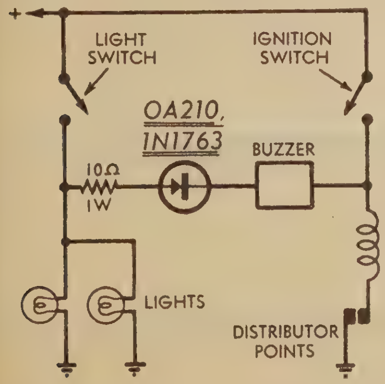
"Many of the theories offered as a solution were ingenious, or even bordering the miraculous, e.g., two conductors, one inside the other; and two RF radio frequencies being transmitted and received by individual tuned circuits."



A light-minder for your car

Have you ever driven with your lights on in rainy or foggy weather and then parked the car without switching off the lights? If you have, you were probably rewarded with a flat battery and a desire to kick yourself, particularly if yours is one of the modern cars devoid of a crank handle and a place to put same.

In a recent issue of the American magazine "Popular Electronics," the writer noticed details of a simple little device which could eliminate this problem by sounding a warning buzzer whenever a vehicle's lights were left on with the ignition turned off. I tried the idea and found it worked so well I thought I would pass it on to other readers.



The device involves only three relatively cheap components and the circuit diagram shows how these would be arranged in a car with 12V negative ground supply. Operation of the device is simplicity itself. If both lights and ignition are on, both terminals of the buzzer are at equal potential and no current can flow. If the ignition only is on then current flow through the buzzer is blocked by the diode. If, however, the lights are on and the ignition is off, current will flow from the battery and through the resistor, diode, buzzer, ignition coil primary and distributor points to ground, and the buzzer will operate.

Operation of the device depends on the distributor points being in the closed position when the motor stops, but in a check on a number of vehicles I found that this was almost invariably the case. It is very seldom that a motor will come to rest with the points in the open position.

The buzzer used can be an inexpensive code practice or doorbell type, preferably one designed to operate from a supply of 3 to 4½ volts. The diode and the 10 ohm-1 watt resistor can, in most cases, be quite easily accommodated immediately adjacent to the light and ignition switches. The terminals of these switches to which the unit should be wired can be easily identified by observing, with a multimeter or test lamp, which terminal shows a voltage to ground when the switches are operated.

A suitable position for the unit might be underneath the vehicle's dashboard

For use in vehicles with a 6-volt battery, the resistor may be eliminated from the circuit and for positive ground vehicles the connections to the diode should be reversed.

Unless you require the device to sound a warning on the parking lights, you should choose that terminal of the light switch which shows voltage to ground ONLY when the headlights are on. (J. Coate).

SCOPE

GETS RIGHT TO THE POINT

EXCLUSIVE SCOPE FEATURES

SPEED
Six!! Yes, only 6 seconds initial heat-up time from cold, then practically instantaneous.

CONTROL
Temperature control at your finger-tips with the exclusive "Switch-Ring." Heat only where, when, and as much as needed.

CONVENIENCE
Ideal for inaccessible spots. No burning of adjacent insulation or parts. Scope conveniently operates on voltages from 2.5 V. to 6.3 V., A.C., or D.C., or 4 and 6 V. accumulator, or from 240 V. A.C. mains through a "National" Scope Transformer.

ECONOMY
One Scope Iron does work of several. Consumes current only whilst in use. No expensive parts to replace. Supplied complete with set of spare elements and instrument-type tip. Plastic pouch-pack with Deluxe Iron.

VERSATILITY
Solders widest range of connections—small or large. Standard and Deluxe out-perform other irons up to 150 WATT rating.

LESS MAINTENANCE
Longer tip life—no expensive heating elements to replace. "Switch-Ring" has no metal to metal contacts to burn out or become high resistant with time.

VARIETY
Scope offers three great models from which to choose.

Standard	Price 55/– ($5.50)
Deluxe	Price 59/6 ($5.95)
Miniscope	Price 52/9 ($5.28)

NEW NATIONAL TRANSFORMER
For full protection insist on a "NATIONAL" Scope Iron Transformer, the only transformer approved by the iron manufacturer to ensure full operating efficiency. Fitted with 6 ft. of 3-core flex and 3-pin mains plug. Price: $6.70 (67/-).

AVAILABLE ALL ELECTRICAL TRADE SUPPLY HOUSES AND HARDWARE STORES
THE FULL GUARANTEE APPLIES WHEN IRON IS USED WITH A NATIONAL TRANSFORMER

AUSTRALIAN & OVERSEAS AGENTS:
Wm. J. McLELLAN & CO. PTY. LTD.
THE CRESCENT, KINGSGROVE, N.S.W. 50-0111

VICTORIA:
A.E.E. CAPACITORS PTY. LTD.
202 BELL STREET, PRESTON. 44-0491

TASMANIA: W. P. MARTIN PTY. LTD.
202 Argyle Street. HOBART

S. AUSTRALIA: COLLETT & CANT PTY. LTD.
103 Halifax Street, ADELAIDE

N.Z.: H. W. CLARKE (N.Z.) LIMITED
42-46 Cable Street, WELLINGTON, C.3

N.Z.: H. W. CLARKE (N.Z.) LIMITED
10 Teed St., New Market, AUCKLAND, S.E.1

W. AUSTRALIA: I. W. HOLMAN & CO
249 James Street, PERTH

QUEENSLAND: K. H. DORE & SONS
505-507 Boundary Street, BRISBANE
ALSO TOWNSVILLE AND ROCKHAMPTON

COUPON

Wm. J. McLellan & Co. Pty. Ltd.
THE CRESCENT, KINGSGROVE, N.S.W. 50-0111
4-66

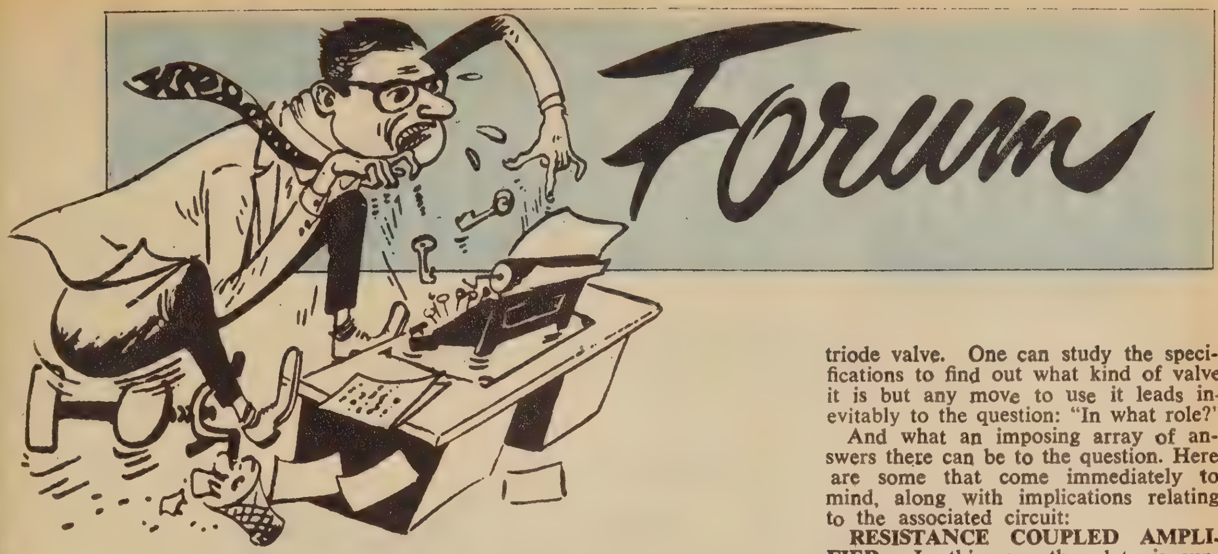
Please forward free illustrated literature and specifications

Name ....

Address ....

My usual supplier is ....

SCOPE



Forum

In this month's Forum, one letter points out an error in our recent article on Xerography. Another makes a plea for simpler presentation of valve data.

By W. N. Williams

The letter on Xerography is published below without comment. As will be apparent from the byline, the original article came from within the Xerox Corporation, as now does this letter in criticism.

When experts disagree, who are we to intervene?

Over the page is a letter which I suggest you read at this juncture. From a slightly different angle, it raises a question which has been asked for as long as I can remember, particularly by people new to the electronic scene.

Having read the letter and put down our correspondent's box of pills, which he actually enclosed, let's take up what is about the most straightforward radio valve you can imagine—a general-purpose triode; and let's get set to use it.

The type number may or may not give a clue as to the class of valve, just as the chemical names of the pill ingredients may or may not mean something to the reader. Some manufacturers have tried hard with valve type numbers; others have regarded such effort as rather futile.

So we turn it up in a valve data book and are greeted with basic information about heater voltage and pin connections. [One must admit that there should have been room here for more standardisation, than has been evident in the past. While some of the changes in valve structure have been the result of evolving technology, a bit more co-operation between valve designers and valve factories could have minimised redundancies.]

Listed also are the valve's characteristics and ratings—its amplification factor, plate resistance, transconductance, permissible voltage, current and wattage limits, plus certain more subtle quantities like inter-electrode capacitances, maximum permissible grid resistance and so on.

These define the article more closely and aren't very different in their functions from the specifications of your motor car—its weight, size, horsepower, seating capacity and so on, through to tyre size, lubrication requirements and the rest.

In relation to a car, of course, or many other products, one can study the specifications and, if the item is judged to be satisfactory, one can purchase and use it. There is little doubt about its role.

But such is not the case with a triode valve. One can study the specifications to find out what kind of valve it is but any move to use it leads inevitably to the question: "In what role?"

And what an imposing array of answers there can be to the question. Here are some that come immediately to mind, along with implications relating to the associated circuit:

RESISTANCE COUPLED AMPLIFIER. In this case the plate is supplied through a resistor, the value of which depends on the gain and frequency response we are seeking. The optimum bias resistor will vary with conditions in the plate circuit.

TRANSFORMER COUPLED AMPLIFIER. Here the plate is fed through a low resistance load and the optimum bias resistor may be quite different in value from the resistance coupled conditions.

GRID-LEAK DETECTOR. This calls for a low plate supply voltage or a large plate supply resistor, a resistor and capacitor in the grid circuit and no cathode bias at all.

ANODE BEND DETECTOR. The abovementioned restrictions do not apply to the plate circuit in this case and

XEROGRAPHY

Dear Sir:

We have read with considerable interest your excellent article on the art of Xerography appearing in the March issue. Whilst we realise that this article is a reprint, we feel it only correct to point out an error. In dealing with the initial charging of the selenium plate or drum prior to exposure the article states:

"The plate is literally sprayed with positive or negative ions. The choice of charge depends on the type of document (a negative or positive) to be copied."

This statement is incorrect. The initial charge given to the selenium surface prior to exposure is at all times a positive one, whether working from a positive original or from a negative original, i.e. white on black. The difference occurs in the type of developer or carrier used, and the transfer charge applied.

If we use a positive type developer, that is, a positive carrier bead making the toner powder negative, it is obvious that if we tried to develop a plate which had previously been given a negative charge then virtually no polarity difference will exist between the image and non-image areas. For this reason failure would result.

Normal procedure when working from a negative original to produce a positive copy is to give the selenium surface a positive charge, and after exposure develop with what is termed "reversal developer." This developer, whilst using the same type of toner powder, has the polarity of the carrier beads reversed, i.e. negative. It, therefore, follows that the toner will assume a positive state. When this developer is cascaded over the surface of the exposed plate the background areas, which, in this case are still charged positively, will repel the toner powder. The image area, therefore, having been exposed, is now neutral and since this creates a polarity difference the toner will be attracted to the image area.

In addition, since the polarity of the toner powder is positive, it follows that to effect a transfer on to another material the charge applied must be the opposite, i.e. negative.

In conclusion we suggest that if any of your readers wish to obtain further information on the process, especially in relation to the production of printed circuit boards, the writer would be most happy to assist.

(R. J. Goodwin, Product Specialist, Rank Xerox Australia, Pty. Ltd., 49 Market Street, Sydney. N.S.W.)

Dual

NEW RELEASE 1019

To complete the famous Dual Range

In addition to the features of the already well known 1009, this new model offers the following refinements for the perfectionist:

1. DIRECT DIAL ANTI-SKATING COMPENSATION
   For complete elimination of distortion from unbalanced tracking, and an end to uneven wear on the stylus and record groove.
2. FEATHER TOUCH CUE CONTROL
   For raising and lowering the pick-up arm smoothly and precisely without vibration. Operative on both manual and automatic play.
3. ROTATING SINGLE PLAY SPINDLE
   For preventing friction at the record centre.
4. ADJUSTABLE CARTRIDGE HOLDER
   For accurate cartridge mounting, guarantees optimum stylus overhang.
5. CONCAVE TURNTABLE MAT
   Prevents even warped records from slipping.
6. PRICES

1019 (without Cartridge)	$134.00
1019/CDS with Crystal Cartridge	$145.70
1019/M44G with Shure Magnetic Cartridge	$160.00

FRED A. FALK & CO. PTY. LTD.

28 KING STREET, ROCKDALE, N.S.W. PHONE 59 4783

Distributed by: N.S.W. and Victoria—all leading electrical houses.
QUEENSLAND—Ron Jones Pty. Ltd., 1-5 Merton Road, South Brisbane.

S.A.—L. S. Wise Ltd., 196 Gilles Street, Adelaide
W.A.—Athol M. Hill, 842 Hay Street, Perth

the grid time-constant components are not necessary but the cathode circuit requires an unusually high value bias resistor.

CATHODE FOLLOWER. Little or no resistance in the plate supply circuit, a very high total resistance in the cathode circuit and the grid returned to a tapping on the cathode resistance string.

So one could go on through a variety of other possible applications in which the valve might figure as an RF oscillator, part of a multivibrator, part of a bridge system in a VTVM and many others.

It becomes immediately apparent from this that there is no such thing as a standard cathode resistor for each valve, a standard plate resistor or a standard anything. Circuit values depend entirely on how the valve is to be used.

To document the one humble triode in the terms which our correspondent would presumably like to see, the manufacturer would have to depict each and every possible circuit application and list the figures for each, with typical sets of constants for various voltage conditions.

What a task this would be—and let's face it: No matter how industriously the manufacturer might try to document his product along these lines, there would be complaints about the figures he didn't put in!

That is why valve and transistor manufacturers—for that matter other electronic component manufacturers—have tended to go the other way. They provide fundamental characteristic data and curves, on which an adequately trained person can base a design. That person alone knows the factors which he is trying to balance, his operating voltages and tolerances, his temperature gradients, his service conditions and so on.

The best a valve or transistor manufacturer can hope to do on a simpler plane is to give a few sets of typical operating conditions in the hope that they will be of some help. They sometimes are but, equally, they can be misconstrued by inexperienced people, who might quite wrongly conclude that the proper cathode bias resistor for a 6AQ5 is 250 ohms. For a certain fairly common set of conditions it is, but certainly not for all applications.

What emerges from this is that electronic circuit design is a fairly exact science. The designer knows what he wants to achieve, he knows the properties and functions of the components to hand and he can both predict and verify results to quite a high order of accuracy.

He simply does not work on the basis: If I put some volts on the plate, through some sort of resistor, the valve ought to draw current and amplify the signal a bit!

Perhaps it would, but the circuit might be grossly inefficient or, perchance, if the volts happened to be too high, the valve would fail prematurely.

Without seeking to answer the question—because I don't profess to know—I must ask whether the administration of pills is a comparably exact science, or whether it should be?

On the back of the tin sent along with the correspondent's letter is the advice "Average individual dose: 1 tablet." It seems so delightfully straightforward, so unambiguous; so different from the mass of data on a valve or transistor.

But when the patient finally receives a bottle labelled with that classic but ill-phrased instruction "Take one tablet three times daily," how near to optimum is the dosage? How closely has it been related to his particular metabolic processes? What guarantee is there that he is not being over-dosed or under-dosed?

VALVE DATA— CUT THE MYSTERY

Dear Sir:

I submit for your consideration for publication in your "Forum" columns, the following:

It has always intrigued me that valves and certain other precision, mass-produced component manufacturers allow it to remain so difficult to obtain information necessary to encourage use of their products. No doubt, in the many service and repair men, component assemblers, laboratory experimenters and innumerable others engaged in some particular form of the electronics industry, they have a vast and presumably adequate clientele to purchase their wares and justify the lines they carry.

The types, varieties and functions of vacuum tubes is vast enough to fill a library but, when one wishes to replace a valve in a certain job, maybe with an allegedly better type which has been heard of and has been recommended (but the characteristics of which are not known) then the search is on! It may be a simple matter to go into a shop and purchase the make and type of valve, which one has heard is so good but, if one hasn't used this particular type before, having purchased it, what does he do next? Jam it into the socket in the blind hope that the pins will match the internal connections of the valve and the correct values of components are attached to the socket?

One might like to know for instance, whether the 250 ohms cathode bias resistor which is wired into the socket he aims to fill, is the most suitable value under the circumstances in which he wants to use it? But does the manufacturer take any trouble to help him? Certainly not. He is determined to leave it as difficult as possible for anyone to obtain the information needed to make that valve give its optimum performance. Possibly he hopes his customer will damage it and be forced to purchase a further replacement. I just wonder why the valve manufacturer is so "tight-lipped" and why he does not show the business acumen of his "cousin," the pharmaceutical drug manufacturer.

Like the valve maker, he too, is responsible for producing some very specialised lines.

But, when he sells his line, does he remain mute as an oyster and insist that one goes and spends days searching through libraries before he can put it to successful use? Not at all. He has the sense and foresight to see that in helping the customer, he is helping himself.

Take, for example, the little container enclosed and suppose one has heard that "Antrenyl" is a very effective line — suppose he is a medical practitioner who, like a serviceman, is highly trained in how to use medicines in general and a good many special ones with which he is familiar in particular. But he has never used Antrenyl before, so, when he receives a sample box, he looks it over and on the back he sees the chemical formula — each tablet consists of 5 mg. of diethylaminoethylphenylcyclohexlhydroxyacetic acid-bromomethylate and excipients—very helpful, very illuminating is it not? It is at least as informative as the odd figures and letters the manufacturer has stamped on the glass envelope of his valve and the outside of the container.

But does the drug manufacturer neglect his clientele from this point on? He wouldn't do much business if he did. No, unlike the valve manufacturer, he encloses within the packet, a little pamphlet giving comprehensive instructions as to when, for what and how, to use his product—expressed in such simple terms that not merely the trained expert, but the man in the street, could use his product—and, he sells them.

Wouldn't valve manufacturers like to increase their volume turnover? Then why don't they do it? Can they expect to sell products that people don't know how to use and have difficulty in finding out?

Yours faithfully, W.N.

How long should he take the pills anyway and what about the doctor who looks quizzically at his patient and says "I think you'd better cut the dose down to half."

Our correspondent, a medical practitioner by the way, opened this discussion by asking why valve manufacturers don't make their instructions simple of application, like the drug houses.

Perhaps, instead of trying to defend the situation, it might be appropriate to ask whether the administration of pills is not on altogether too arbitrary a basis. Perhaps the drug houses are remiss in not supplying "characteristic curves" relating size, frequency and duration of dosage with the patient's age, weight, physical condition and anything else that matters.

Perchance the medicos are actually lagging their electronic counterparts in the matter of precision, and that they won't catch up until every consulting room is wired back to a central computer, which will do for the medico what curves and slide rules do at present for the electronic engineer.

I doubt that we should hope for the day when an electronic engineer is heard to say "Try 100 volts this week, but, if the valve keeps getting red in the face, cut it down to 50."

USING REVERBERATION UNITS

The recent release, by one of our advertisers, of a line of inexpensive reverberation units has prompted quite a few enquiries on the subject. Having purchased such a unit, how does one go about using it?

By W. N. Williams

In the past, reverberation units have found application in three main directions:

RADIOGRAMS: A number of stereo radiograms were released some years ago with in-built reverberation facilities. The idea did not seem to catch on, probably because most modern recordings are made in surroundings which impart some natural reverberation; the need to add more is debatable.

ELECTRONIC ORGANS: Played in a small room, an organ in which the tones are simply keyed on and off, can sound rather mechanical, particularly at the hands of an inexperienced player. The addition of artificial reverberation reduces the effect and adds interest to the sound.

ELECTRIC GUITARS: The plucked strings of a guitar provide a more reverberant kind of sound than the signal switching of an electronic organ. However, artificial reverberation has been widely favoured by electric guitarists, along with tremolo or vibrato, to add variation and interest to the music.

Recently, a number of readers have raised with us the question of using artificial reverberation in connection with domestic tape recorders. Behind the inquiries is the thought that reverberation might take some of the rawness off their recordings, due to inexperienced performers and the acoustically inadequate rooms in which the recordings have to be made.

As often as not, the inquirers go on to ask for a reverberation circuit, obviously in the same terms as they might ask for a preamplifier or tone control stage.

Unfortunately, there is no practical way of providing artificial reverberation by purely electronic means — in the sense of a particular configuration of valves, transistors, resistors, capacitors, etc. The time delays achievable by such means are far too short to have any acoustic significance. In practice, some mechanical or acoustic element has to be resorted to, to produce reverberation effects extending to a second or so.

For the kind of applications which have been mentioned, the only really practical method is by the use of commercial reverberation units of which, to date, those produced by the Hammond Organ Company have been the best known.

In the Hammond unit, the original signal is fed into two separate transducers, so designed that a tiny arm protruding from each rotates through a small arc, in sympathy with the signal frequency and amplitude.

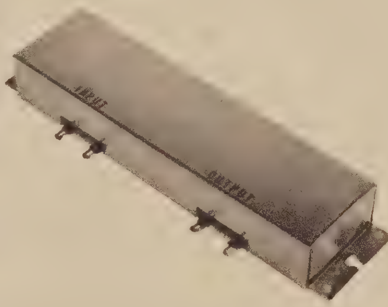
Attached to each arm is a long spiral spring, the remote ends being anchored on two other "output" transducers. When the input transducers impart a rotary vibration to one end of each spring, the impulse travels down the spring and causes an equivalent rotary vibration of the output transducers. These, in turn, generate corresponding signal voltages.

The springs are designed to have different transmission times and frequency characteristics so that, along with signal reflection effects in the springs, the unit gives a dispersed pattern of synthetic echoes over the frequency band.

By relying on a rotary action in the transducers, the system is rendered less sensitive than otherwise to external mechanical vibration. In addition, each spring transmission path is made up of two springs wound in opposite directions and connected end to end, with the aim of cancelling energy from external vibration. The Hammond design also has the basic assembly attached flexibly to the main mounting frame.

Not surprisingly, even with all these precautions, the unit is sensitive to substantial vibration and can produce microphonic effects if mounted carelessly in relation to the loudspeakers or where it can be bumped.

The signal passing through such a unit needs to be kept at as low a level as practical to minimise non-linearity and distortion effects. In our experience, the preferred method is to feed signal to the input transducers from the voice coil of the main amplifier—through a series resistor to reduce the voltage and a series capacitor selected to discriminate progressively against frequencies below about 250cps.



Small but efficient is this reverberation unit currently being offered by one of our advertisers.

The "reverberated" output signal available from the unit is quite small, in these circumstances, and requires the use of a separate reverberation amplifier having a preamplifier stage and an order of sensitivity roughly about what one would provide for a crystal microphone.

Use of a reverberation unit along these lines, together with the circuit of a reverberation amplifier, was featured in connection with our electronic organ project, in the April, 1962, issue of this journal (then under the name "Radio, Television and Hobbies").

In the May, 1963, issue, a somewhat more elaborate feed system was presented, with the very desirable feature of automatic volume expansion in the reverberation channel.

The use of a reverberation unit with electric guitar amplifiers was discussed in December, 1962. Mention was made in this article of the compromise (but dubious) practice of reinserting the reverberated sound into the main amplifier.

A couple of years ago the original Hammond reverberation unit was superseded by a somewhat smaller model with, however, much the same electrical characteristics. The transducers had a similar "medium" order of impedance—about 2000 ohms at 1KC—and, for all practical purposes, it was a direct replacement for the earlier unit, with which our development work had been done.

Such then is the answer to the original question about using reverberation units: They need to be fed with the direct signal, as set out in the abovementioned articles. The reverberated signal must then be amplified all over again, from about "microphone" level, through a separate amplifier and loudspeaker system.

If one is setting out to design a radiogram, an electronic organ or an electric guitar amplifier with inbuilt reverberation, no special difficulty is involved. The extra amplifier channel, which may well be of modest specifications, has to be accommodated along with the actual reverberation unit: It adds something to size, weight and cost but that is about all.

In fact, it is often quite practical to add reverberation facilities to equipment of the abovementioned type, even not originally envisaged. With a little good fortune, the extra system can be accommodated in the existing cabinet work or in a suitably styled companion unit.

With domestic tape recorders, however, space is usually at such a premium that there can be no question of building in the reverberation facility. Normally, the extra equipment — unit, amplifier and loudspeaker — would need to be housed in a separate box, picking up a signal from the loudspeaker voice coil in the recorder proper.

(Note that blocking capacitor (s) or an isolating transformer may be required if the voice coil winding in the tape recorder does not have one side earthed to chassis).

The chances of avoiding a separate add-on unit are slight. In a stereo tape recorder, with separate access and separate controls for the individual channels, it may be possible to use one channel as a mono source and the other as a reverberation amplifier channel.

Again, in single channel equipment, with multiple input and mixing facilities, it may be possible to feed the output through a reverberation unit, returning a modest amount of reverberated signal into a vacant input channel. The amount of signal which can be so fed back before instability occurs is limited, but it may be worth trying in the isolated case.

All these schemes envisage use of the reverberation to supplement the direct sound when being played back. The alternative of actually recording a reverberated component, along with the direct signal, would call for a good deal more ingenuity.

In one way or another, portion of the signal to be recorded would have to be diverted through a separate amplifier into a reverberation unit, then re-injected and mixed with the direct signal after the original split and before the record head. The chances of being able to arrange this in an ordinary domestic tape recorder without considerable internal modification are rather slight.

THE NEW UNITS: Finally, what of the imported reverberation units which are currently being sold by Messrs Ace Radio for $5.75 — a fraction of the price of the original Hammond units?

Firstly, they are very compact, measuring about 7¼ x 2¼ x 1 inches overall, and far smaller than either of the Hammond units.

Without having time to test one of the units exhaustively, we did substitute it for a Hammond unit in the Playmaster Electronic Organ, using the volume compression type of input circuit mentioned earlier.

The level of signal from the unit from the same input circuit was several dB higher, calling for less than the full gain of the organ reverberation amplifier.

Frequency response appeared to be similar to that of the Hammond unit over the upper register but with a more sustained response at the bass end. This was not an automatic advantage, however, since it tended to make the organ rather heavy in the left hand and would have called for a smaller input coupling capacitor to re-balance the sound.

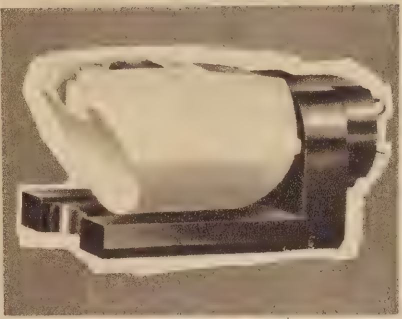
However, we gained the definite impression that the low frequency response was good enough to allow pedal-only reverberation to be achieved, making possible a pedal sustain effect, not otherwise practical in some organs.

The sensitivity of the unit to external small energy vibration appeared to be lower than that of the original Hammond unit, with which it was compared, so that there was less ringing, at comparable reverb level, from heavy footfalls or console noises.

However, because the unit is not separately sprung in a chassis mount, it does not have the same immunity to heavy vibration and some form of shock mountings may be necessary in certain cases.

However, it appealed to us as a very compact and efficient unit, and very good value at the price to anyone wishing to experiment with reverberation effects.

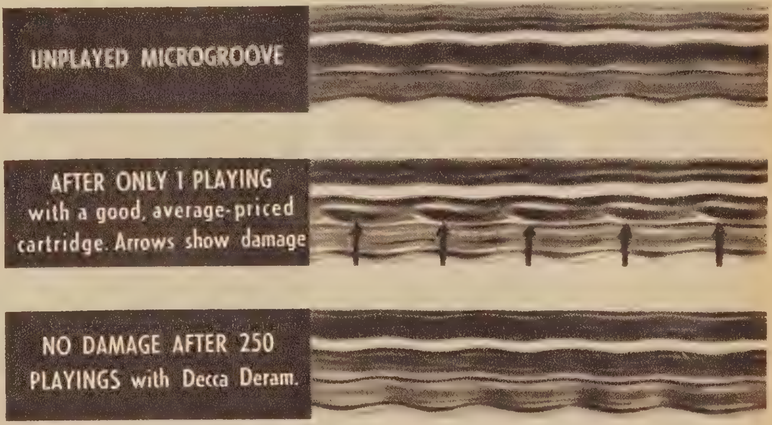
LITTLE SHORT OF
REVOLUTIONARY



DECCA
Deram

MICROGROOVE "CERAMIC" CARTRIDGE
fitted with diamond stylus
for stereo or mono microgroove records

Micrographs of a groove recorded with a 10 Kc signal taken from three copies of the Decca stereo frequency test record SXL 2057.


UNPLAYED MICROGROOVE
AFTER ONLY 1 PLAYING with a good, average-priced cartridge. Arrows show damage
NO DAMAGE AFTER 250 PLAYINGS with Decca Deram.

THE DECCA DERAM DOES LESS DAMAGE AFTER 250 PLAYINGS THAN THE AVERAGE CARTRIDGE DOES AFTER ONLY ONE

The Decca Deram has a tip mass of 0.6 milligramme; its compliance is 9 x 10^{-6} cms/dyne (lateral) and 5 x 10^{-6} cms/dyne (vertical); tracking weight 2.5 gms.; frequency response ± 3dB 18 c/s to 18 Kc/s.

Retail Price
$12.60
(£6/6/-)
Liberal Discounts to the Trade

Sole Australian Agent:

BRITISH MERCHANDISING PTY. LTD.

60 Clarence St., Sydney, N.S.W. Telephones 29.1571 (3 lines)

Also available, a range of Arms from $17.95 (£8/19/6)

A TWO-BAND AERIAL FOR AMATEURS

This approach to a multi-band aerial may be new to quite a number of our readers. With a minimum of equipment, it is possible to get complete satisfaction from such an aerial. Although this article deals mainly with one particular combination, it is hoped to follow it with a description of further developments along the same lines.

By Ian Pogson

In suburban locations, it is usually a problem to find enough space to erect an aerial for the 80 metre band, let alone find more space for another aerial for the 40 metre band. Admittedly, this sounds rather worse than is normally the case these days, as a number of ways have been found to solve the problem.

Before proceeding with details of the aerial which we are about to describe, it would perhaps be appropriate to refer to the two aerial systems which were described in May, 1965. These multiband systems are the multiple dipole and the trap dipoles, both capable of giving good results.

However, there are often instances where neither of these systems is acceptable to a particular location. In the case of the multiple dipoles, if 3.5MC operation is required, there may not be 130ft or so available to erect them. The trap dipole system is somewhat better in this regard, as it is only about 112ft long.

Although both the multiple and trap dipoles can be made to cover all the high frequency amateur bands, more often than not operators who wish to use the 14, 21 and 28MC bands, see fit to erect some sort of rotary beam.

Our new single wire aerial for 3.5 and 7MC has quite a lot to offer. Firstly, it is only 100ft long, but may be made somewhat longer or shorter if desired. In fact, it may be shortened to as little as 66ft and still have reasonable efficiency. Another decided advantage, is that this aerial will respond only to the two frequencies, having no harmonic responses.

Naturally, when used for transmission on 3.5MC, should the second harmonic be present, it will be radiated efficiently. On the other hand, as there are no responses at higher frequencies, the aerial will tend to reject any higher harmonics which may be generated.

Although it is known that an aerial which is resonant at a fundamental frequency, will generally resonate at odd multiples or harmonics of the fundamental, a repetition of this point would not be out of place here. If an aerial is resonant on say 7MC, then it will more than likely respond to 21MC, 35MC and so on.

This leads to another point worth consideration. Where a beam or other aerial is used for 21MC transmission, in the presence of another aerial which will resonate in this band, then it is inevitable that the latter will re-radiate and so upset the radiation pattern of the beam. As our two band aerial does not respond to 21MC, then it will have little effect on the beam performance.

Although we are giving details for a system which is tuned to 3.5 and 7MC only, it is possible to arrive at dimensions for say, 14 and 21MC, 14 and 28MC, or 21 and 28MC. If any readers feel disposed to try this system for the higher frequencies mentioned, then there is no reason why they should not do so. However, while we may publish something along these lines in the future, details are not yet available.

Turning now to the details of the system, figure 1 shows 50ft of wire each side of a centre insulator. Across this insulator, are a capacitor and inductor in parallel, with a link coil to the co-ax feedline. Now 100ft is shorter than a half wave length on 3.5MC and longer than a half wave length on 7MC.

The capacitor has a relatively large reactance at 3.5MC and so the inductor (coil) effectively lengthens the aerial, so that it may resonate at this frequency. On the other hand, the inductor has a relatively large reactance at 7MC and the capacitor has the effect of shortening the aerial so that it may, in turn, be resonated at the second frequency of 7MC. This, perhaps, is an over simplification of the functioning of the circuit, but an analysis of the operation would be beyond the intended scope of this article.

However, figure 2 gives an idea of the current distribution for the two frequencies. The maximum current at the centre for 3.5MC occurs within the inductor. On the other hand, there are three points of maximum current for 7MC, one on either side of the physical centre and which are in phase, with another within the tuned circuit and out of phase with the other two.

Without delving into the theory of operation of this method of tuning, the practical approach with a GDO, which is essential, and an SWR bridge which is desirable but not essential, can be most interesting and informative. The details which we have given for this aerial may be followed completely, but even so, it is still necessary to have a GDO to adjust the aerial properly to both frequencies. Such varying outside influences as nearby objects make this necessary.

Details are now given for the duplication of the aerial which we have made and used successfully. Later, we will explain how these specifications may be varied within reason, to suit other individual needs.

As illustrated in figure 1, the radiating portion is made up of two lengths of wire, each of fifty feet, with good-quality glass insulators, one in the centre and one at each end. Figure 3 shows the construction of the centre tuning unit. Our inductor was wound on a tablet (Veganin) container, which measures 1⅝in diameter, 4⅛in long, with a screw cap. The tuning capacitor is mounted inside the former and with the end of the former sealed off, the capacitor is protected from the weather.

Five holes are drilled in the former as indicated. A 4BA screw is pushed through from inside and secured with a nut on the outside. The area surrounding the nut is sealed off with any suitable glue which will withstand the weather. A solder lug is then fitted to each screw, secured with another nut.

The screws and lugs are so placed that the coil may be wound towards one end. This is done so that the capacitor may be placed inside the former but at the other end to the coil. The reason for this is to keep the capacitor out of the field of the inductor, but this is more of academic than real practical importance. In short, it would not really matter if the capacitor were mounted inside the inductor.

Associated with this offsetting of the coil, it will be noticed that there are five screws and lugs provided for terminations. One end of the inductor has to be extended to the far end of the former so that it may be connected conveniently to the corresponding end of the centre insulator.

Our inductor consists of 18 turns of 18 gauge enamelled wire, close wound and terminated on the appropriate lugs. As individual installations will vary, one from another, it would be wise initially to start with, say, 19 turns. The amount of capacitance in our unit is a little over 50pF. This is made up with two 100pF NPO ceramic capacitors in series, with a Philips air trimmer across them. At first, this combination appears to be rather modest where a reasonable amount of transmitter power has to be handled. However, we have had no trouble on SSB, running 100 watts or so input

(Continued on page 79)

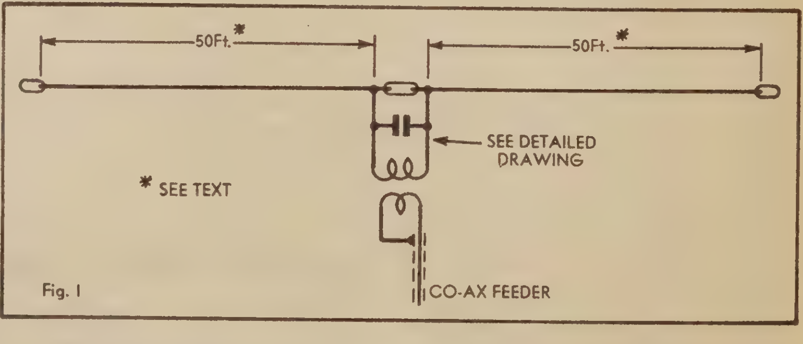


Fig. 1

At first sight, this aerial may appear as a variation of the "trap" system. While this may be true up to a point, there are a number of differences.

We interrupt this magazine for a very important announcement...

World-famous
FISHER
stereo components are now available in Australia at the following authorised dealers:

N.S.W.

Arrow Electronics Pty. Ltd.,
432 Kent Street, Sydney—29 8580.

Asdic Stereo Specialists,
166 Glebe Road,
Glebe—68 1014.

Broadway Electronics Pty. Ltd.
32 Glebe Road, Glebe—68 1171.

Convoy International Pty. Ltd.,
449 Kent Street,
Sydney—29 6475.

Mastersound Sales Pty. Ltd.,
400 Kent Street,
Sydney—29 1527.

Victor A. & Co.,
196 Elizabeth Street,
Sydney—61 2967.

Albert Wright,
793 New Canterbury Road,
Hurlstone Park—55 2696.

Victoria

Thomas' Pty. Ltd.,
92 Bourke Street,
Melbourne—32 1615.

Sheffield's,
27 Sturt Street,
Ballarat—2 5938.

Queensland

Brisbane Agencies,
16 Stanley Street,
South Brisbane—4 5466.

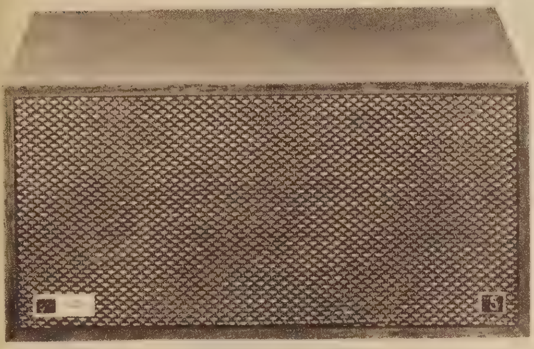
TEL-AIR,
21 Adelaide Street,
Brisbane—2 7656

Trackson Bros. Pty. Ltd.
157 Elizabeth Street,
Brisbane—2 2804.

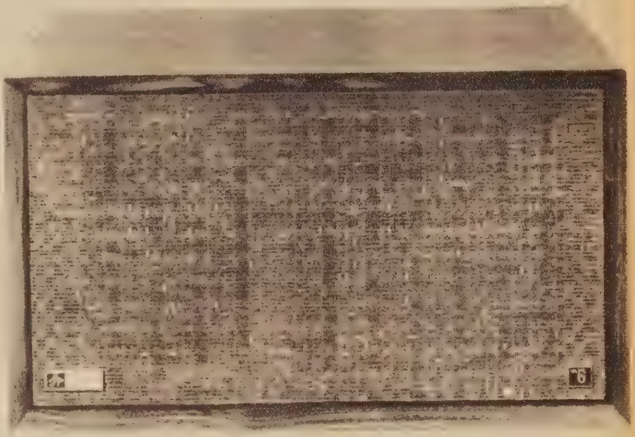
SOLE DISTRIBUTORS:
RCA OF AUSTRALIA PTY. LTD.
An Associate Company of the Radio Corporation of America.
SYDNEY • MELBOURNE • BRISBANE • PERTH

The Fisher X-101-C
60-Watt Stereo Control-Amplifier
with heavy-duty output circuitry, exclusive hinged cover over the less frequently used controls, centre-channel output for optional third speaker, front-panel headphone jack, complete phono and tape facilities: $296.

The Fisher X-100-A
40-Watt Stereo Control-Amplifier
With large output transformers, advanced control features, front-panel headphone jack, complete phono and tape facilities: $240.

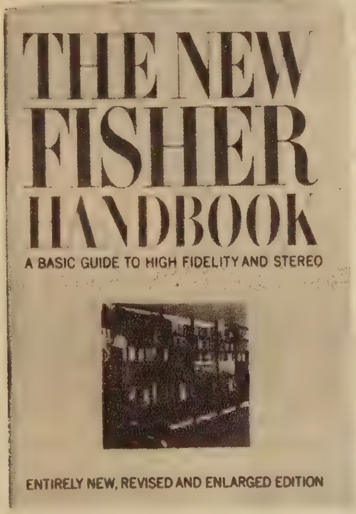


The Fisher XP-5
Ultracompact Free-Piston Loudspeaker System
with 8" low-resonance woofer, 2½" wide dispersion tweeter, 2000-cps crossover, clean response down to 38 cps: $98.



The Fisher XP-6
3-Way Free-Piston Loudspeaker System
with 10" low-resonance woofer, 5" midrange speaker, exclusive 1½" soft-dome tweeter, 300 and 2500 cps crossovers, response 35 cps to beyond range of audibility: $152.

Buying stereo? The first thing you need is free


THE NEW
FISHER
HANDBOOK
A BASIC GUIDE TO HIGH FIDELITY AND STEREO
ENTIRELY NEW, REVISED AND ENLARGED EDITION

Fill out and mail this coupon for your complimentary copy of The New Fisher Handbook, available to readers of this magazine without charge or obligation. Whether or not you know a great deal about high fidelity and stereo, you will find this comprehensive 76-page reference guide and idea book a valuable aid in making buying decisions—the first thing you need before investing in expensive equipment! Detailed information on all Fisher components is included.

To RCA OF AUSTRALIA PTY. LTD.
SYDNEY: 221 Elizabeth St.
MELBOURNE: 2 Stephenson St., Richmond
BRISBANE: 173 Ann St.
PERTH: 280 Stirling St.

Return to
your nearest
RCA distributor

Free!
$2 Value! 76 pages!

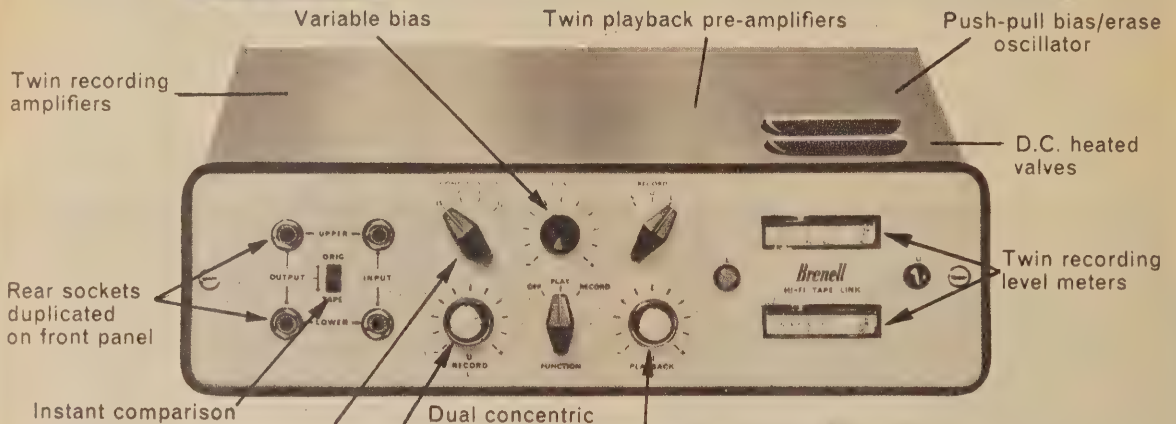
NAME..

ADDRESS..

....

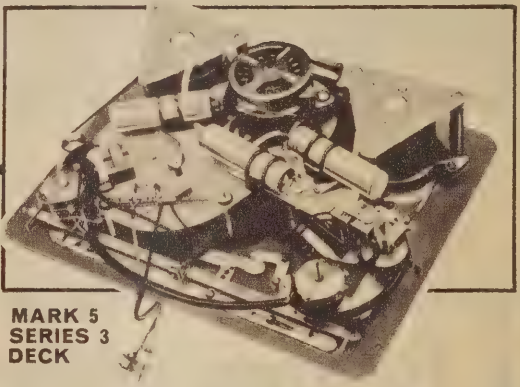
HERE'S VERSATILITY FOR YOU . . .

The Brenell MONO/STEREO HI-FI TAPE LINK

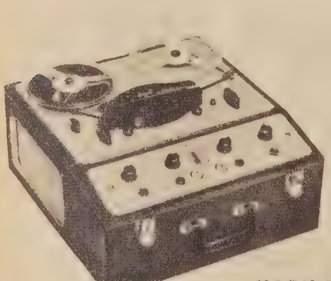

Variable bias
Twin playback pre-amplifiers
Push-pull bias/erase oscillator
Twin recording amplifiers
D.C. heated valves
Twin recording level meters
Rear sockets duplicated on front panel
Instant comparison of original and recorded signals
Dual concentric gain controls for recording amplifiers and playback pre-amplifiers
Frequency correction for 4 tape speeds
UPPER
OUTPUT
ORIG
TAPE
INPUT
LOWER
RECORD
OFF
PLAY
FUNCTION
PLAYBACK
Brenell
HI-FI TAPE LINK

Designed for use with 2/2 or 2/4 track heads

Built to the same high standards as our tape recorders and decks this HI-FI TAPE LINK has been developed for use with your high fidelity equipment. It is capable of giving superb results when matched to one of our Mark 5 Series 3 decks fitted with the appropriate heads. Write for full details of this amplifier and deck and complete range of tape recorders.



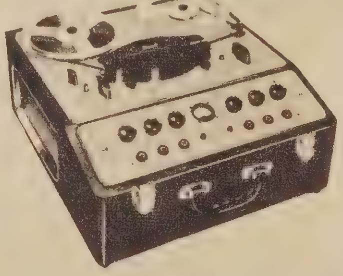
MARK 5 SERIES 3 DECK



MARK 5 SERIES 3

MONO—HALF TRACK—TWO HEADS—MAGIC EYE
(Available with recording level meter at extra cost.)

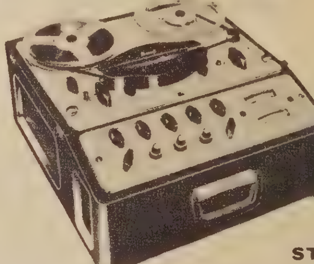
High quality amplifier with power output of 2½ watts r.m.s. and a frequency response of 40-20,000 c/s—can be used independently of tape recorder—narrow gapped record/playback head for extended frequency response—double gapped ferrite erase head to minimise erase noise—headphone monitoring.



MARK 5 TYPE M SERIES 3

MONO—HALF TRACK—THREE HEADS—RECORDING LEVEL METER

Separate record and playback heads—separate record and playback amplifiers—amplifier frequency response 25-26,000 c/s ± 3dB—power output 2 watts r.m.s.—separate bass and treble controls—mixing of input signals—speaker monitoring whilst recording.



STB2

MONO/STEREO—HALF TRACK (Record/playback)—QUARTER TRACK (playback) FOUR HEADS—TWO EDGEWISE METERS

Designed for use with high fidelity stereo installations—adjustable attenuators on all input channels—dual concentric recording/playback level controls—cathode follower output—4-channel mixing on mono programmes—twin recording, twin playback pre-amplifiers—adjustable bias level—sound-on-sound facilities.
Optional extra: stereo power amplifiers and monitoring speakers.

Mail this coupon to your nearest RCA dealer for further details. (Tick as required.)

☐ Brenell Mono/Stereo Hi-fi Tape Link.
☐ Brenell Mark 5 Series 3 Deck.
☐ Brenell Mark 5 Series 3 Tape Recorder.
☐ Brenell Mark 5 Type M Series 3 Tape Recorder.
☐ Brenell STB2 Tape Recorder.

Name of Company..

Type of Business..

Address..

Brenell

Sole Distributors:

RCA OF AUSTRALIA
PTY. LTD.

An associate Company of Radio Corporation of America.

SYDNEY: 221 Elizabeth Street. 61 8541.
MELBOURNE: 2 Stephenson Street, Richmond. 42 4586.
BRISBANE: 173 Ann Street. 2 7884.
PERTH: 280 Stirling Street. 28 5057.
ADELAIDE: Newton McLaren Ltd., Leigh Street. 51 0111.

power. Should any difficulty be experienced with breakdown, it can be quickly remedied by fitting higher voltage capacitors.

The coupling coil is wound over the centre of the other winding, and consists of four turns. This should be right but if you wish to be on the safe side and to avoid any possibility of having to rewind to five turns later on, the extra turn may be included initially. The coupling coil is terminated on the remaining two lugs.

The centre tuning assembly completed, it may be connected across the centre insulator and, before the feedline is connected, the aerial should be tuned up with it as near as possible to its final position. This may be difficult, as is often the case when tuning aerials, and this problem must be left to the ingenuity of the individual.

Tuning is done with a GDO, which is accurately calibrated, if not it can be checked against a calibrated receiver. The precise frequency to which the aerial is to be tuned on each band must first be decided. For example, 3.6 and 7.07MC may be selected as the wanted centre frequencies.

Although adjustments will interact to some extent, similar to aligning a superhet receiver, the inductor will control mainly the low frequency and the capacitor mainly the high frequency characteristics.

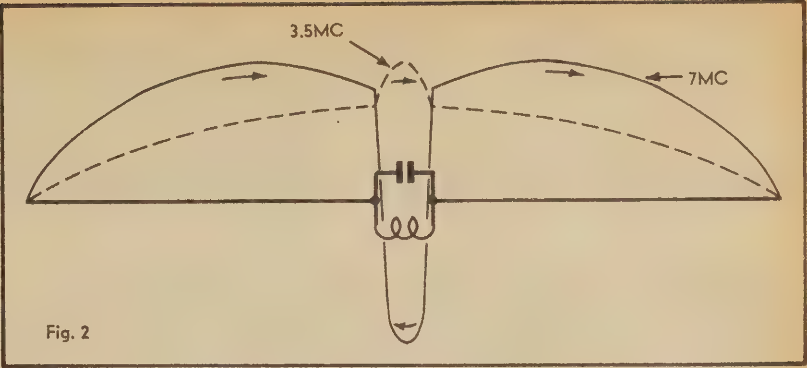


Fig. 2

This shows the current distribution for the two bands of operation. The curves are drawn for the 50ft lengths as shown in figure 1.

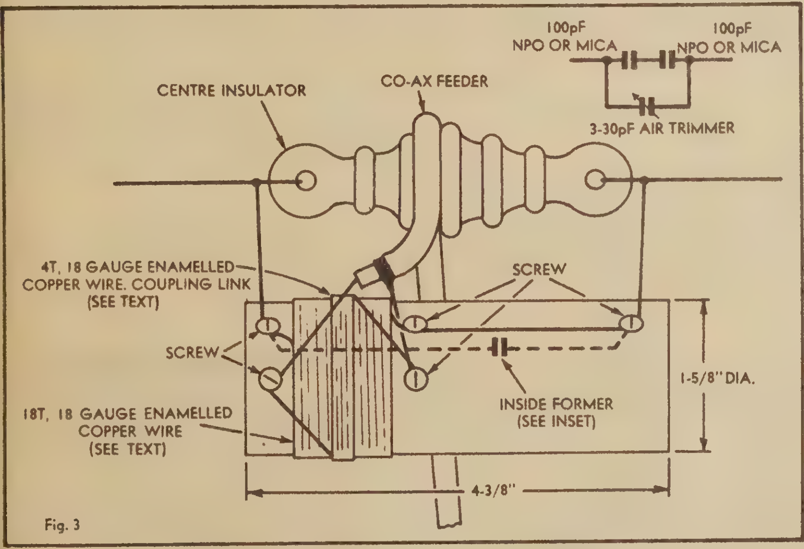

100pF
NPO OR MICA
100pF
NPO OR MICA
CENTRE INSULATOR
CO-AX FEEDER
3-30pF AIR TRIMMER
4T, 18 GAUGE ENAMELLED COPPER WIRE. COUPLING LINK (SEE TEXT)
SCREW
SCREW
18T, 18 GAUGE ENAMELLED COPPER WIRE (SEE TEXT)
INSIDE FORMER (SEE INSET)
1-5/8" DIA.
4-3/8"

Fig. 3

Although no photographs were taken, this drawing probably shows the mechanical arrangement of the tuning system more clearly. Weight of the feeder should be isolated from the coil as shown.

A preliminary adjustment should be made first to the 7MC frequency, by bringing the GDO coil just close enough to the inductor, so that a dip can be detected. Adjust to the correct frequency by varying the trimmer capacitor across the inductor. Now make a check of the 3.5MC frequency. More than likely, with the extra turn, the frequency will be rather too low. Try to bring it into line by spreading one or more of the end turns. If this is still not enough, it will be necessary to remove a turn.

With the low frequency right, go back to the high frequency and it will probably be found that a slight adjustment of the trimmer will be needed. This process must be repeated until both frequencies are correct. Although this reads as an involved process, it is quite easy, and if this procedure is followed, the aerial will soon be adjusted.

With the aerial tuned to the two bands, the feedline may be connected. Figure 3 shows how we brought the co-axial cable up to the feed point. The cable is brought over the insulator, with the bared leads pointing downwards. This will prevent the ingress of moisture into the cable, which should be avoided. The cable is tied to the insulator, which takes the weight, so avoiding any strain on the electrical connections. The centre conductor and braid are then connected, one to each lug of the coupling coil.

If an SWR bridge is not available, four turns only should be left on the coupling coil. This will ensure a reasonably low SWR on the line. In these circumstances, the aerial is ready for use.

If an SWR bridge is available, further checks should be made so that the aerial will be set for optimum operation. By means of the bridge, check the SWR at spot frequencies right across each band. The point of lowest SWR indicates the actual resonant frequency of the aerial. If an adjustment is indicated, it is not a difficult matter to make any small alteration to the inductance or capacitance, as required.

The SWR is also affected by the amount of coupling between the inductor and the coupling coil. It may be necessary to reduce the number of turns from the five as originally suggested, to four. Even finer adjustment may be made by spreading the turns of the coupling coil. It will be found that there is an adjustment which will give a very low SWR for both bands.

The aerial proper may be erected in any of the conventional ways, but one configuration which is gaining popularity these days, is the inverted "V." And not without good reason. This method allows a greater length to be fitted into a given space and there is also good reason to believe that it also makes an efficient radiator. In short, there is no reason why you should not erect the two band aerial as an inverted V.

Earlier, we said that it is possible to make this aerial with an overall length of radiator, either greater or less than the one which we have described. This is quite easy to do, with the aid of a GDO. A little cut and try will be necessary, to obtain the correct values of inductance and capacitance. It will be remembered that the inductor controls mainly the low frequency, while the capacitor controls mainly the high frequency. It will also be remembered, that we do not get something for nothing, so do not make your two band aerial any shorter than is absolutely necessary.

Although we have specified a coil wound with 18 gauge enamelled wire and wound on a former with a diameter of 1⅝in, these dimensions are by no means essential. Provided the correct value of inductance is obtained, the other point to watch is the Q of the coil. A reasonably heavy gauge of wire should be used, with adequate coil dimensions.

Just one final word. An aerial is no better than the care which has been taken to adjust it. It MUST resonate at the wanted frequency and the SWR should be kept to a practical minimum. These points are overlooked far too often.

REFERENCES:

Ruckert, "Tests With Multiband Components and the VK2AOU Triband Beam," "Amateur Radio," May, 1958.

Ruckert, "The Triband Beam at VK2AOU," "Amateur Radio," June, 1958.

Twin-Five Watt Class-A Stereo Power Amplifier

Described in the July-August 1965 issue (Vol. 8, No. 4) of the journal "Mullard Outlook" was a small three-transistor power amplifier design which has apparently been constructed by quite a few of our readers. Following the description of our silicon transistor Control Unit in December last we have received a number of enquiries from such readers regarding the compatibility of the two designs.

By Jamieson Rowe

Recently we were able to spend a little time examining the Mullard-RCS design and checking its compatibility, and our findings are the subject of this article. Sufficient information is given later in the article to enable readers to use two of the amplifiers as a stereo power amplifier which becomes a lower-power alternative to our own Playmaster 113 unit described last month.

Before describing the modifications required to adapt these amplifiers for use with our Control Unit, it may be worthwhile examining the original design and briefly comparing its apparent design philosophy with that behind our own power amplifier.

As originally described the amplifier uses in the output stage an AD140 alloy junction germanium power transistor operated in class A. The collector return of the AD140 is completed via a 50mH inductor, with the 15-ohm loudspeaker load connected to the collector via a 640uF electrolytic capacitor.

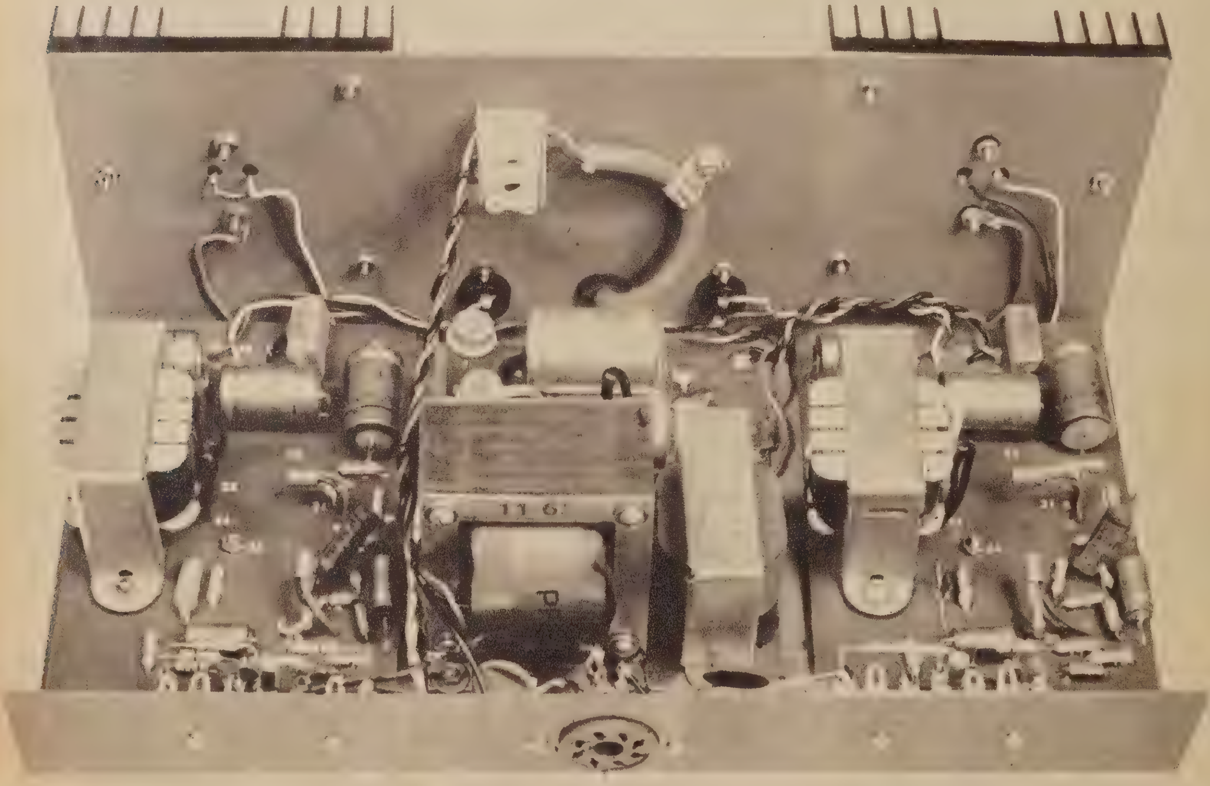
Presumably a single-ended class-A output stage was chosen for two main reasons: low inherent distortion and low cost. While the first of these advantages is undeniable it should be realised that with output stages of 5-watt capacity or higher, the saving afforded by the use of a single output transistor is largely absorbed in providing a collector feed inductor and power supply capable of supplying the high and constant drain of class-A stage.

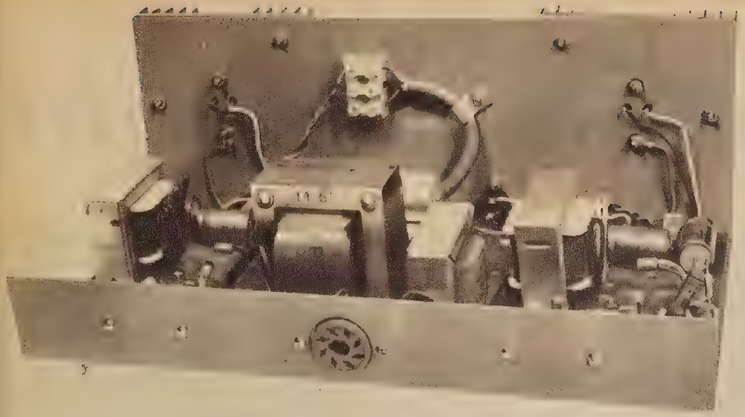
The choice of an AD140 alloy-junction germanium transistor for the output stage is a point worthy of some comment. In the first place, the AD140 is a relatively low cost device and might thus appear more attractive than the 2N2147 power drift type used in our own design. At the time of writing, the 2N2147 is some 30 per cent dearer than the AD140.

However, the AD140 has a rather low common-emitter cutoff frequency—around 4KC. This means that to attain a "good" high frequency response (say, to 20KC) a considerable degree of negative feedback must be applied. While the latter may seem a good thing from distortion considerations it can become an embarrassment—both at high frequencies where the phase shift of the power transistor itself increases, and at low frequencies where the collector feed inductor introduces losses and phase shift.

In this case, the improvement in distortion afforded by the feedback is only obtained at middle frequencies, because the loop gain and feedback fall to a low level at both ends of the range, due to the characteristics of the transistor and feed inductor.

In contrast with the AD140, the 2N2147 power drift device has a high power gain and a common-emitter cutoff





frequency of around 20KC. Using this device it thus becomes considerably easier to obtain a satisfactory frequency response and stability margin.

Although the 2N2147 is more costly ind two devices are required for push-pull class-B operation, the overall cost of the output stages and power supply is ipproximately the same, as each channel equires only a small driver transformer ind the quiescent current drain is quite nodest. And with negative feedback the listortion can be kept to a very low level, is we have shown in earlier articles.

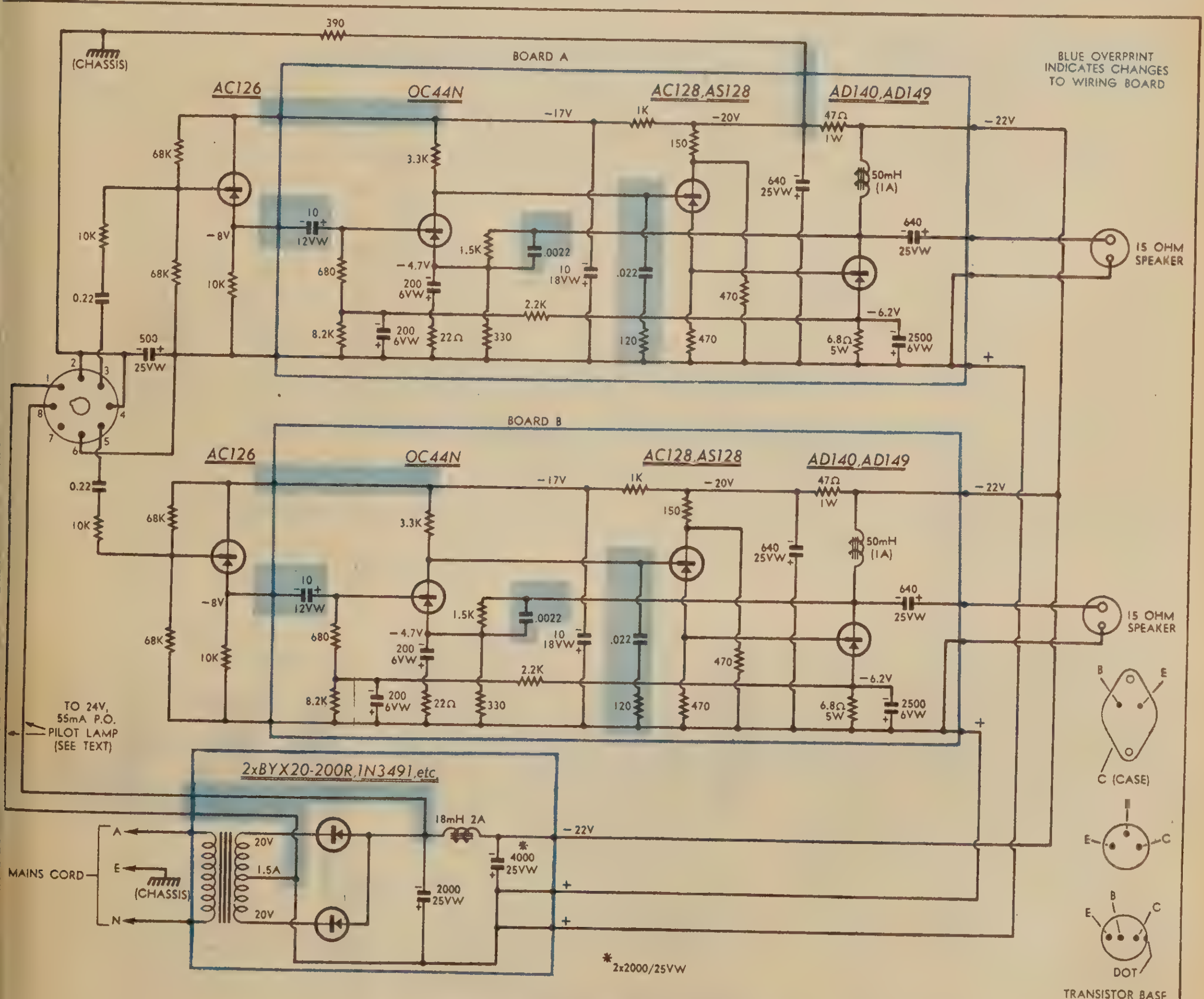
The driver stage in the Mullard-RCS design uses an AC128 transistor connected as an emitter follower, to provide essentially constant-voltage drive. It is directly coupled both to the AD140 base and to the collector of the pre-driver stage. The pre-driver stage uses an OC44N low-noise transistor operated in the common-emitter configuration.

Both DC and AC overall negative feedback are applied to the amplifier in the interests of stability. There is direct feedback from the emitter of the AD140 to the OC44N base, giving the circuit excellent thermal stability, while another feedback circuit (both AC and DC) from AD140 collector to OC44N emitter is used to stabilise and improve the frequency response and distortion performance.

In this design the input impedance of the OC44N transistor is primarily determined by the AC negative feedback and, as the loop gain varies widely over the frequency range, the input impedance also varies widely. It would appear that the designer elected to swamp out this impedance variation by using a very low resistance base feed resistor, with its "cold" end heavily bypassed to ground. This gives the original amplifier design a fairly constant input impedance, but one which is quite low— about 680 ohms.

Because of this very low input impedance the original amplifier is not directly compatible with preamplifiers designed to work into medium to high impedance loads. Thus it is not directly compatible with our Playmaster 112 unit, which was designed to work into loads of about 40K or greater.

To match the two it is necessary to use an impedance matching device such as a transformer or emitter follower. As wide-range transformers are quite costly and tend to increase distortion, we have elected to employ emitter follower stages (one per channel).

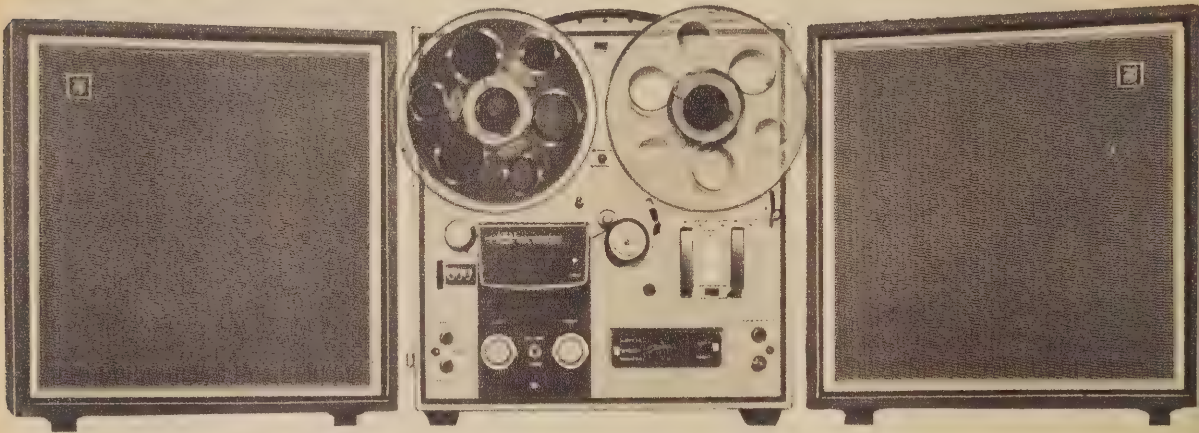


(CHASSIS)
390
BOARD A
BLUE OVERPRINT INDICATES CHANGES TO WIRING BOARD
AC126
OC44N
AC128,AS128
AD140,AD149
-17V
1K
-20V
47Ω 1W
-22V
50mH (1A)
640 25VW
15 OHM SPEAKER
-8V
-4.7V
-6.2V
2500 6VW
6.8Ω 5W
BOARD B
TO 24V, 55mA P.O. PILOT LAMP (SEE TEXT)
2xBYX20-200R,1N3491,etc.
18mH 2A
MAINS CORD
A
E
N
20V
1.5A
4000 25VW
2000 25VW
*2x2000/25VW
B
E
C (CASE)
DOT
TRANSISTOR BASE DIAGRAMS

MULLARD-R.C.S. STEREO AMPLIFIER

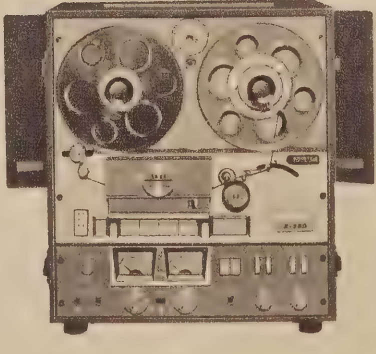
Modified for use with Playmaster 112 Control Unit

WITH PRIDE WE OFFER TAPE RECORDERS OF REAL QUALITY



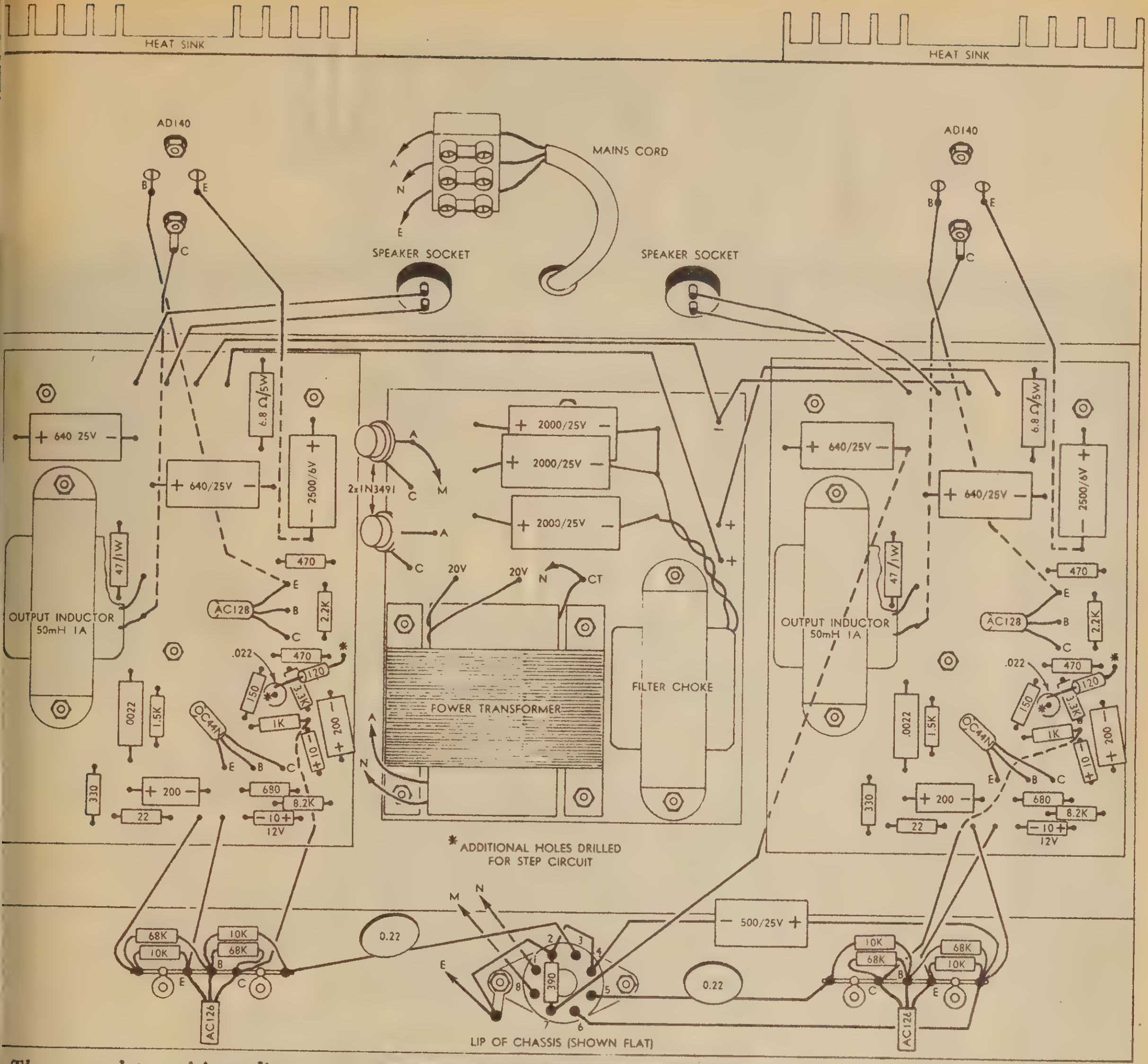
MODEL **1700** **Amateurs Can Enjoy Professional Results without paying professional price.** This compact model is a 4-track stereo/monaural record and playback tape recorder. It is light in weight and even ladies can carry it gracefully with ease. You get the same Akai quality at this surprisingly low price. It has a frequency response of 40 to 18000 cycles per second; 3-speed (1⅞, 3¾, and 7½) and 15 ips optional; two built-in speakers; automatic stop; simple change-over to AC power. This Akai Model 1700 is selling exceptionally well in the United States under the brand name Roberts 1630. The matching stereo speaker Model SS-30 is also available.

MODEL ***355*** Cross-Field head plus Solid State Amplifier * Music Power 50 Watts (25 watts each) * 4-track stereo monaual record and play back * 3 speeds (3¾", 7½" and 15" per sec.) * Frequency response—30 to 24,000 cps. at 7½" per sec. * Two built-in speakers * Automatic reversing and repeating playback * All push button operation * Automatic stop and shut-off * Remote controls available * Unit card system amplifier included * Simple change-over for the necessary AC power



AKAI®
TAPE RECORDER

AKAI ELECTRIC CO., LT
HIGASHIKOJIYACHO OHTA-KU TOKYO JAPA
MAGNECORD AUSTRALASIA PTY LT
210 Clarence Street, Sydney Tel. 29 5127


HEAT SINK
HEAT SINK
AD140
AD140
B
E
C
MAINS CORD
A
N
E
SPEAKER SOCKET
SPEAKER SOCKET
640 25V
640/25V
640/25V
6.8 Ω/5W
2500/6V
2000/25V
2000/25V
2000/25V
2x1N3491
M
20V
20V
N
CT
47/1W
470
OUTPUT INDUCTOR 50mH 1A
AC128
2.2K
.022
120
150
33E
1K
200
OC44N
.0022
1.5K
POWER TRANSFORMER
FILTER CHOKE
330
200
680
8.2K
10
12V
22
*ADDITIONAL HOLES DRILLED FOR STEP CIRCUIT
68K
10K
AC126
0.22
500/25V
390
LIP OF CHASSIS (SHOWN FLAT)

The complete wiring diagram shown above should be used in conjunction with the circuit and photographs as a guide to assembly.

PARTS LIST FOR COMPLETE UNIT

1 Power transforemr, 20V-0-20V secondary at 2A.
2 Output inductors, 50mH at 1A.
1 Filter inductor, 18mH at 2A.
2 Amplifier boards, RCS type 675 or equivalent.
1 Power supply board, RCS type 681 or equivalent.
2 4in x 4in finned radiators, type 7001 or similar.
1 Chassis, as required.

TRANSISTORS, DIODES:

2 AD140, AD149, etc.
2 AC128, AS128, etc.
2 OC44N, AC107, etc.
2 AC126, etc.
2 BYX20-200R, 1N3491, etc.

RESISTORS:

2 x 6.8-ohm 5 watt; 2 x 22-ohm ½ watt; 2 x 47-ohm 1 watt; 2 x 120-ohm ½ watt; 2 x 150-ohm ½ watt; 2 x 330-ohm ½ watt; 1 x 390-ohm ½ watt; 4 x 470-ohm ½ watt; 2 x 680-ohm ½ watt; 2 x 1K ½ watt; 2 x 1.5K ½ watt; 2 x 2.2K ½ watt; 2 x 8.2K ½ watt; 4 x 10K ½ watt; 4 x 68K ½ watt.

CAPACITORS

2 x .002uF LV plastic; 2 x .02uF LV plastic; 2 x 0.22uf ceramic; 2 x 10uF 12VW electro; 2 x 10uF 18VW electro; 4 x 200uF 6VW electro; 1 x 500uF 25 VW electro; 4 x 640uF 25VW electro; 2 x 2500 uF 6VW electro; 3 x 2000uF 25VW electro (or 1 x 2000uF and 1 x 4000 uF).

MISCELLANEOUS:

Nuts, bolts, wire, solder, speaker sockets, mains cord, etc.

As may be seen from the circuit, the nitter follower stages are quite straight-rward and use low-cost AC126 transtors or similar. The stages themselves ovide an input impedance of approxnately 30K, which is supplemented by K input series resistors to produce e desired 40K input impedance. Al- ough the series resistors introduce a nall loss in gain, the input sensitivity r full 5W output is still quite adequate approximately 260mV.

It should be noted that the addition the emitter followers to the original nplifiers necessitates polarity reversal the original input coupling capacitors. nese originally were wired with their gative electrode to the OC44N bases, it are now arranged to present these ectrodes to the AC126 emitters.

Supply voltage for the emitter follow- is taken from the OC44N supply ints. This provides some 17V which quires no further decoupling or filter-g.

In addition to the provision of the nitter followers we have made two changes to the original amplifier design in the interests of improved AC stability. The original AC feedback phasing capacitor of .005uF has been reduced to .002uF, while a low-pass step circuit consisting of a .02uF capacitor and 120 ohm resistor has been added from AC128 base to ground.

In passing it should be noted that we have found the above changes to be very worthwhile even on the amplifiers as originally described. We would recommend that constructors of the amplifiers make the changes regardless of whether

FROM WHARFEDALE A "GO ANYWHERE" PUBLIC ADDRESS SYSTEM!

Wharfedale

This easily operated PA 30 Wharfedale Public Address System is one of the first products to reach world markets from the new Wharfedale Developmental Electronics Division. Completely portable and fully transistorised, the Wharfedale PA 30 has an output of 30 watts (IHFM rating) and may be used indoors or out, with battery or AC power. Size is 36" x 10" x 8" and weight only 42 lbs. Six specially designed Wharfedale speakers form the sound column, and this versatile system is supplied with an omni-directional moving coil microphone which may be used with a lavalier or a collapsible 5' 6" microphone stand. Both lavalier and stand are included in the c veniently located accessories. The complete system c be "on the air" within five minutes of arrival, on a location. Inputs are provided for radio tuner, tape recor or gramophone pick-up. Battery life can be up to 50 hou This remarkable Wharfedale Public Address System ideal for use in schools, churches, sales conventions auction sales, in lecture theatres, hotels and restaura and in small halls. In larger premises an extens speaker (Model XT 30) may be desirable. When u outside range is approximately 100 yards.

Ask for a demonstration of the Wharfedale PA 30 . . .
simply 'phone either Simon Gray office or any Interstate Representative.

Australian National Distributors :

Simon Gray Pty. Ltd.

Head Office: 28 Elizabeth Street, Melbourne, Vic. Tel. 63 8211, 63 8166
Sydney Office: 26 Ridge Street, North Sydney, N.S.W. Tel. 92 3890.

INTERSTATE REPRESENTATIVES:
N.S.W.: Audio Engineers Pty. Ltd., 342-344 Kent Street, Sydney. Tel. 29 6731
S.A.: Eilco Sales Pty. Ltd., 9 Osmond Terrace, Norwood. S.A. Tel. 3 6345
Q'land: Sydney G. Hughes, 154-158 Arthur St., New Farm, Brisbane. Tel. 58 1014
W.A.: Athol M. Hill, 613-615 Wellington Street, Perth. Tel. 21 7861
Tas.: K. W. McCulloch Pty. Ltd., 109 York Street, Launceston. Tel. 2 5322
A.C.T.: Australian Physical Laboratories, P.O. Box 225, Canberra City.
Tel. 4 3010 (Mr. J. E. Howe)
N.T.: Pfitzner's Music House, Smith Street, Darwin. Tel. 3801

they intend to use them with our Playmaster 112 Control Unit.

As the Playmaster 112 Control Unit requires a negatively earthed supply source, a slightly unorthodox arrangement must be used to power it from the common positive system of the Mullard-RCS amplifiers.

The common positive line of the power amplifier supply system is NOT earthed to the power amplifier metalwork but is left floating. Power for the Control Unit is taken from one amplifier at the —20V point and decoupled via a 390 ohm resistor and a 500uF electrolytic. The junction of these two components is then connected to the power amplifier chassis and mains earth, and connected to the Control Unit and signal input earth system via pins 2 and 4 of the interconnection plug.

This arrangement ensures that the connection of pickups, tape heads and other signal sources to the Control Unit will be quite straightforward. However t should be noted that NEITHER side of the speaker leads may be earthed as both are at a DC potential above ground.

The main point to watch is that the common earth conductors on the power amplifier boards do not make contact with the chassis via the board mounting screws. To make sure of this we lightly countersunk each board mounting hole on the copper side, and mounted the boards using the insulating pillars upplied.

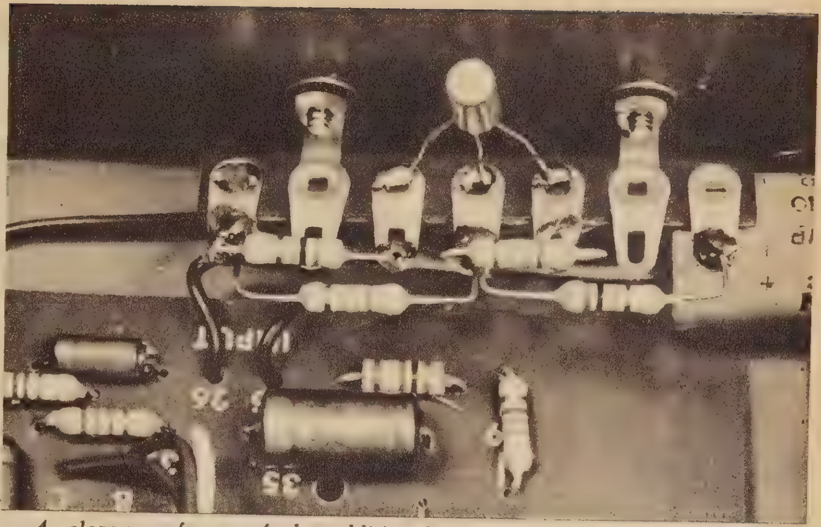
To operate the Playmaster 112 Conrol Unit from this supply source it is ecessary to remove the two zener diodes riginally specified and replace them vith a single 100uF 25VW electrolytic apacitor. The 22K series resistor conecting to pin 7 of the interconnecting lug must also be removed and replaced y a direct connection.

The power supply for the amplifier ystem is a simple full-wave circuit using 0-amp silicon power diodes followed by "brute force" pi-section filter. Although e amplifier drain is less than 2 amps, igh current types are used, both ecause of their cheapness (they are ass-produced automotive types) and beause they require no heat-sink at the urrents involved.

As the diodes have "press-fit" cases hich are normally used for the cathode onnection, it is necessary to solder ires to the cases to connect to the iring board. Providing this operation done quickly and with reasonable re, no damage will result as the vices have quite a high temperature ting.

The first filter electrolytic is a 2000uF it while the second can be either a 00uF unit or two 2000uF units in rallel as shown in the photographs. ote that as 25VW capacitors are used re for economy the power supply ould NOT be operated unless it is aded either with the amplifiers or a avy-duty resistor. Otherwise the ltage on the capacitors will rise above V and may cause them to be damaged.

Power for the Control Unit pilot lamp taken directly from the rectifier outt, as with our Playmaster 113 amplir. However as only 23V (approx.) are ailable from the Mullard-RCS power pply it will be necessary to use a 24V mA bulb instead of the 45V type ecified for use with our own design. ain the bulb should be of the "No. 2 lephone switchboard" variety, available on order from most suppliers.



A close-up of one of the additional emitter follower stages used to increase the amplifier input impedance.

Those who have not read last month's article should note that the use of an incandescent pilot lamp involves the isolation of the lamp circuitry from that of the rest of the Control Unit, and its connection to pins 1 and 8 of the interconnection plug.

The prototype unit shown on these pages was assembled for our tests from pre-assembled amplifiers and a power unit supplied by R.C.S. Radio. It is not presented as a physical layout which readers should necessarily duplicate, although the simple metal "L" bracket shown may well prove convenient if the unit is to be fitted into a compact cabinet.

As the photographs show, we fitted the two emitter-follower stages on 7-lug tagstrips on the front lip of the bracket adjacent to their respective amplifiers. It should be noted that no connection is made to the earth lugs of these tagstrips.

The step circuits are added to the amplifier boards by drilling two additional holes in the positions shown and joining the two components in mid-air. As both components are quite light this procedure is in order and should give no trouble.

To aid constructors in modifying the amplifier boards and making the correct connections for the emitter follower stages, etc., we have prepared a wiring diagram of the complete stereo amplifier. No doubt this will also be of assistance to those who wish to construct the complete design as an alternative to the Playmaster 113.

As with all projects involving transistors and printed wiring boards there are a few points which should be borne in mind if the unit is to work correctly right from the initial switch-on. With small transistors, resistors and capacitors, be careful not to bend the pigtails too close to the component body or through too acute an angle; and when soldering to the board avoid overheating either the board or the component. The use of long-nose pliers gripping the pigtails as a heat-sink is strongly recommended.

The power transistors are electrically insulated from their radiator blocks via the mica washers and bolt sleeve washers normally supplied with each transistor. The mica washers should be lightly smeared with silicone grease before assembly for maximum cooling efficiency.

It is most advisable to check the transistor-radiator block insulation with some sort of continuity tester before connecting the transistor into circuit, in case a small metal whisker or burr has been missed. If this is not done the outcome could be quite expensive.

If these points are followed and the usual care taken with assembly the amplifier will operate as it should as soon as power is applied. And being fully transistorised, it should give many years of trouble-free operation.

ELECTRO-BOY

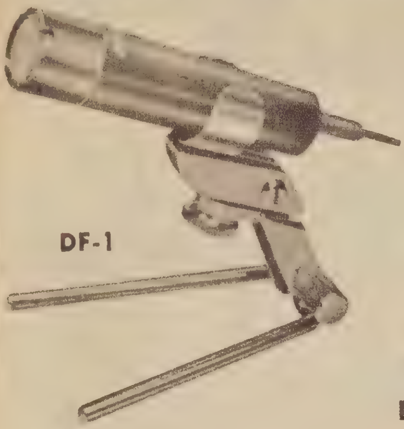
UNIVERLAL TIME SWITCH CLOCKS

- Switch ON-OFF or OFF-ON any kind of electrical equipment.
- Switch contact capacity 1500 watts at 240 volt AC 50-cycle.
- Seventy two switching operations can be set in advance over a period of 24-hours.
- Dial face calibrated in black for 12-hour (normal clock face) and in red for 24-hour period.
- Accurate synchronous electric clock movement 240v 50 cycle.
- Ideal for recording radio programmes in the absence of the operator; turning off and on electrical appliances in the winter; controlling external lighting.

PRICE: $26.40
(post paid)

WILLIAM WILLIS & Co. Pty. Ltd.
428 ELIZABETH ST., MELBOURNE, C.I
Phone 34-6539

foster dynamic microphones

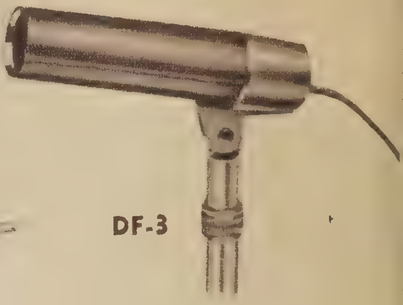


DF-1

50K ohms £5-12-0
50 ohms £4-18-6
Price Retail Plus Tax
Frequency Range
100-12,000 C/S.

DF-2

50K ohms £2-14-0
50 ohms £2-5-7
Price Retail Plus Tax
Frequency Range
200-10,000C/S.



DF-3

50K ohm £4-16-0
50 ohm £3-18-4
Price Retail Plus Tax
Frequency Range
50-15,000 C/S.

ZEPHYR PRODUCTS PTY. LTD.
58 HIGH STREET, GLEN IRIS, S.E.6, VICTORIA, AUSTRALIA

AGENTS D. K. Northover & Co.—Neil Muller Ltd.—Homecrafts (Tas.) Pty. Ltd.—Jacoby, Mitchell & Co. Pty. Ltd.—T. H. Martin Pty. Ltd.—P. H. Rothschild & Co. Ltd., New Zealand.

CONVOY PRESENTS:

A BREAKTHROUGH IN SPACE

Our wives won't let us play music loudly. They won't have bulky ugly equipment with wires trailing in all directions.

BUT! they'd all love a new attractive coffee table

This is your chance to bring in the Hi-Fi equipment and tape recorder of your choice.

Come and see our exclusive new CONVOY '707' coffee table fold away unit. (Illustrated)

From $290. Complete.

CONVOY INTERNATIONAL
449 KENT STREET, SYDNEY
Telephone 29-6475

SEE US ANY TIME FOR THE KEENEST QUOTE ON YOUR REQUIREMENTS

For the hobbyist

A PENDULUM TYPE ELECTRIC CLOCK

Here is a project which should appeal to those of our readers who combine an interest in things electrical with old-fashioned craftsmanship — a pendulum type electric clock. Carefully constructed, such a clock can be a feature in the home and, as well, a very accurate timekeeper. Purchased from an English hobby journal, the article was originally presented in our September 1944 issue.

The design follows well-tried principles and has been proved by many aders who have constructed clocks ong these lines, since the article first ppeared. Typical reports indicated a me-keeping accuracy to within at least ne half-minute per week, some clocks perating for weeks on end before any ror became apparent.

As indicated by the title, this type clock depends for its accuracy on e well-known pendulum principle. It quite different, therefore, from the pular synchronous clocks, whose curacy is dependent upon the fre- iency of the AC power mains. These tter are so cheap and so plentiful that e construction of one could hardly be nsidered seriously as a craftsman pro- ct.

A "Grandfather" pendulum clock, on e other hand, is a rare item, now- lays, and can bring a good deal of easure to the craftsman-hobbyist.

Let's look first at basic principles:

If a pendulum is set in motion and en allowed to swing freely, it will be served to oscillate smoothly from side side; the arc described by each oscil- ion will gradually diminish as air sistance and other inevitable losses tard its movement.

However, it is found that the actual quency of the swing remains substan- lly the same, irrespective of. whether pendulum is describing a very large very small arc.

By imparting to the pendulum a small pulse at predetermined intervals, it possible to maintain the pendulum a constant state of mechanical oscil- ion. Then, by coupling it mechani- ly to a train of gear wheels, it can made to govern the speed of a clock vement with a high degree of uracy.

In pendulum type clocks of the nestic mantelpiece variety, the pen- ums are small and not particularly cient. A mechanical impulse is sup- d by the clockwork on every com- te stroke, which tends to impart nething of a jerky motion to the dulum, detracting from its ability to ern the movement with a high degree precision.

The clock here described follows the randfather" style, with a long, heavy dulum. This is capable of oscillat- freely for quite long periods, but a gnetic impulse is applied automati- y when the amplitude of the swing ches a certain minimum figure.

y careful design, the impulse may ur at intervals of from 10 to 20 nds; during the intervening periods, pendulum is substantially free from side influence, and therefore capable of regulating the movement with a high degree of accuracy.

Main factor in regulating the frequency of oscillation is the overall length from the point of support to the centre of the bob. The longest conventional pendulum is approximately 39 inches, which gives a natural period of one swing per second, or two seconds for one complete oscillation—i.e., from the centre to one extreme, through to the other extreme and then back to the centre.

In other words, the pendulum commences to move in a given direction every two seconds. In describing this movement, it is made to operate a ratchet which advances the clock mechanism by an amount equivalent to two seconds. If mounted on the second hand spindle, the driving rachet would therefore require 30 teeth around its circumference, being advanced one tooth every two seconds.

What is known as the three-quarter pendulum has a length of about 22 inches, and is intended to operate at 80 swings or 40 complete oscillations per second. It normally drives on to a 40-tooth wheel.

Since the length of the pendulum governs the frequency of oscillation, it is particularly important to see that it is not affected by changes in temperature, which are naturally likely to cause expansion and contraction.

It is possible to construct compensated metal pendulums, but, from the home builder's point of view, by far the simplest method is to construct the main pendulum bar of polished wood, with metal attachments at top and bottom.

The movement of the pendulum can be communicated to the hands by a variety of means, but a simple and reliable method is to utilise the wheel train from a discarded alarm clock. If the pendulum frequency is properly adjusted, the gear ratios will see to it that the hands describe the proper movement.

The magnetic impulses can likewise be imparted to the pendulum in a variety of ways, but the method described is probably the best for the particular

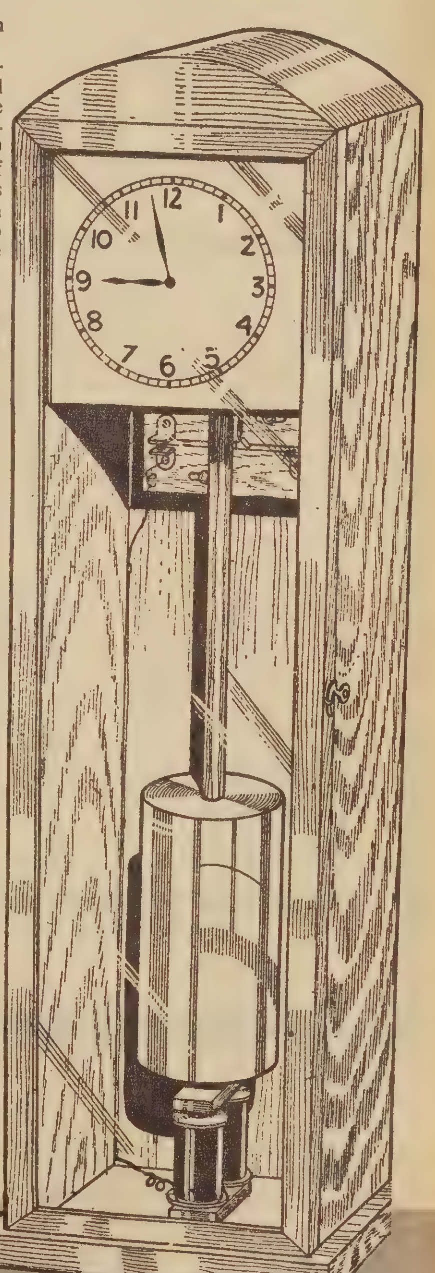


Figure 1; This drawing is intended to give some idea how the finished clock might appear. In practice, individual clocks would normally be styled and finished to blend with the general decor of the home. A high order of time keeping accuracy is possible.

21 NEW OUTPUT TRANSFORMERS

From

FERGUSON

PRESENTING A COMPLETELY REVISED RANGE OF MEDIUM FIDELITY OUTPUT TRANSFORMERS

TYPE	NOM. WATTS	PRIMARY IMPEDANCE OHMS.	CIRCUIT APPLICATION	SECONDARY IMPEDANCE OHMS.
OPM1A	5	7000,5000	S.E.	15,8,3.7,2
OPM19A	5	7000,5000	S.E.	500,250,166,100
0PM20A	5	10000,8000	S.E.	15,8,3.7,2
OPM2A	7	10000	P.P.	15,8,3.7,2
OPM15A	10	10000,7000,5000 2500	P.P. or S.E.	3.1
OPM3A	10	4000,2500	S.E.	15,8,3.7,2
OPM4A	10	4000,2500	S.E.	500,250,166,100
OPM16A	10	500		15,83.7,2,
OPM5A	15	5000,3000	P.P.	15,8,3.7,2
OPM6A	15	5000,3000	P.P.	500,250,166,100
OPM7A	15	(10000),8000,7000	P.P.	15,8,3.7,2
OPM8A	15	(10000),8000,7000	P.P.	500,250,166,100
OPM17A	15	500		15,8,3.7,2
OPM10A	25	(8000),6600	P.P.	15,8,3.7,2
OPM9A	25	(8000),6600	P.P.	500,250,166,100
OPM18A	25	500		15,8,3.7,2
OPM14A	35	(8000),6600	P.P.	15,8,3.7,2
OPM11A	35	(8000),6600	P.P.	500,250,166,100
OPM13A	55	3500	P.P.	15,8,3.7,2
OPM12A	55	3500	P.P.	500,250,166,100
OPM21A	100	(4500)	P.P.	500,281,125,31.25

( ) Impedances in brackets indicate screen taps available.

FEATURING

- Extended freq. range 40-30,000 cps ± 2 db.
- Vacuum impregnation.
- Reduced physical size, greater flexibility.
- Individually packaged with full specifications.

MELBOURNE: A. H. Nicholls & Co., 22 Elizabeth St., East Bentleigh. 97-4252.
ADELAIDE: W. T. Matthew, 95 Grenfell Street. 23-6202.
BRISBANE: Keith Percy & Co. Pty. Ltd., Waterloo Street, Newstead. 2-1757.
PERTH: Athol M. Hill, Durham House, 613 Wellington St., 21-7861.
CANBERRA: Errol Nazer, 98 Barrier Street, Fyshwich. 90-325.

FERGUSO
TRANSFORMERS PTY. LT
331 HIGH STREET, CHATSWOOD, NSW 40-0

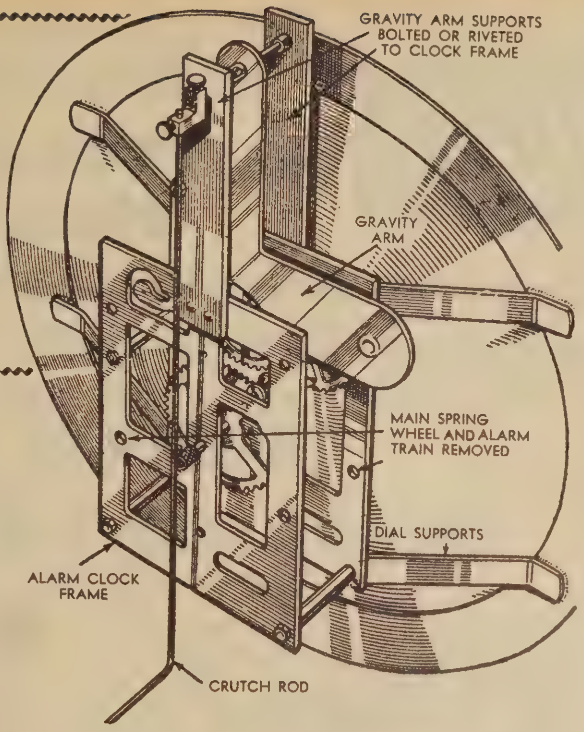
FREE CATALOGUE

Please send a Ferguson Catalogue to:—

NAME ....

ADDRESS ....

E.A.466. ....


GRAVITY ARM SUPPORTS BOLTED OR RIVETED TO CLOCK FRAME
GRAVITY ARM
MAIN SPRING WHEEL AND ALARM TRAIN REMOVED
DIAL SUPPORTS
ALARM CLOCK FRAME
CRUTCH ROD

igure 2. — A general view of the assembled wheel train nd dial as seen rom the rear. Note he vertical brass rackets riveted to he clock frame and upporting the grav-ty arm. The pen-ulum drives the crutch rod.

equirements of this rticle. Once adjust-d, the operation is ntirely automatic, nd the impulse ccurs when the endulum is approxi-iately in the vertical osition. Experiments idicate this to be enerally preferable other methods.

So much then for e general prin-ples. It now remains discuss the particular design sug-sted by the accompanying sketches. It ill be seen that the basis of the move-ent is a cheap alarm clock of the pe which is so often found discarded the handyman's cupboard.

Figure 6 shows diagrammatically the mplete mechanism and the manner in hich the hands receive their motion, hile figure 1 is intended to give some ea of how the clock will appear when e components have been assembled. e reader can vary the design of the se to suit himself.

Referring to figure 6, A, B and C e three wheels mounted on independ-t arbors; the wheel C rotates once ch hour, from whence it follows that e arbor carries the minute hand.

Loosely mounted on the same arbor the "cannon," J, carrying the hour nd. One end of J is attached to the eel O, receiving motion through two nilar wheels L1 and L and a pinion the wheel L is driven by the arbor ich carries the wheel C. This group wheels constitutes the "dial wheels."

The wheel C meshes with the pinion ich is mounted on the same arbor the wheel B. Wheel B, in turn, shes with the pinion carried by the or to which is secured the ratchet eel A, driven by the "gravity arm" medium of the pawl.

The gravity arm is secured to an or oscillated by a crutch rod and ich is engaged at every alternate swing the pendulum T. The combined ight of the arm and crutch rod must adequate to cause the pawl to propel wheel A while returning to their ial position after displacement by the dulum rod.

Matters are so arranged that when pendulum swings to the left it dis-es the crutch rod and gravity arm the same direction; simultaneously pawl is withdrawn (being wedge-ped) and picks up a tooth of the el A.

The pendulum now commences to swing toward the right, but is followed up by the crutch rod and arm. The energy stored in the arm is thus utilised in driving the wheel A one tooth forward. This movement is, in turn, transmitted through the wheel work to the hands of the clock.

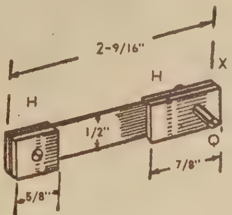


Figure 3 — The pendulum suspension spring. The small end fits into the pendulum, the larger into the suspension bracket, figure 13. Weight is supported by pin "Q."

The scheme for maintaining the vibration of the pendulum is as follows: An ordinary wooden pendulum, equipped with a heavy "bob" U, has a threaded extension terminating in the armature W.

Fixed rigidly beneath the armature is an electromagnet X so placed that the armature just swings clear of the electromagnet.

When, however, the arc of vibration becomes reduced to a predetermined value, a small "finger" or "trailer," Y, pivoted to the upper portion of the rod T fails to swing clear of the small wedge-shaped block Z attached to a light spring.

One end of this spring is riveted to a bracket, while the free end of the spring is equipped with a contact engaging with a stationary contact.

On the return swing of the rod T, the finger Y, having previously dropped into a nick in the block Z, levers down the spring; momentarily the contacts are closed, and the magnet X is energised.

When the contacts close, the leading edge of the armature W is just about to pass over the magnet cores; consequently the excitation of X attracts the armature and the pendulum is impulsed.

An increased arc of vibration of the pendulum results, so that the finger Y is again carried clear of the block Z for several swings of the pendulum.

Gradually, however, the swing becomes reduced, and the finger again fails to clear the block Z, when the contacts are again closed.

This simple means of impulsing the pendulum is automatic in action and economical as far as current consumption is concerned.

The clock may be powered conveniently by a six-volt bank of dry cells—four of the larger torch cells or two cycle lamp batteries connected in series. When the cells are new, they give a healthy impulse to the pendulum, which will typically describe about 40 swings between pulses. As the batteries age the swings between pulses reduce in number,

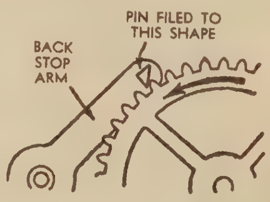


Figure 4—Details of the backstop. The arm should be sufficiently free and heavy to operate by its own weight, without spring loading.

GLOSSARY OF TERMS

ARBOR: An axis or shaft upon which a wheel or pinion is mounted.

BALANCE WHEEL: The small oscillating wheel which controls the movement of a watch or small clock, replacing the larger pendulum.

CANNON: A wheel in the motion work. A wheel or pinion with an extended pipe to which a hand is attached.

ESCAPEMENT: The small rocker arm in a watch or clock which simultaneously drives the balance wheel and communicates the latter's controlling effect to the wheel train.

PAWL: A pivoted catch engaging with a ratchet wheel or rack either to prevent reverse movement or to convert its own reciprocating motion into an intermittent rotary or linear motion.

Homecrafts PTY LTD

AUSTRALIA'S LARGEST Radio, Television and Hobbies SPECIALISTS

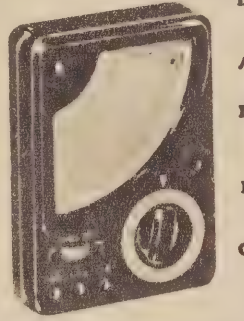
307 ELIZABETH STREET, MELBOURNE—60-1442.

★ We have everything for the Radio Hobbyist ★

MODEL 200H

20,000 Ohms per Volt DC 10,000 Ohms per Volt AC.

Specifications:



DC Volt: 0-5, 0-25, 0-50, 0-250, 0-500, 0-2.500.
AC Volt: 0-10, 0-50, 0-100, 0-500, 0-1,000
DC Current: 0-50, Microamperes, 0-25, 0-250 Milliamperes.
Resistance: 0-60K Ohms, 0-6 Meg Ohms.
Capacity: 0-01-0.3mfd (at AC 5 volt 0.0001-01mfd at AC 250 Volt).
Decibel: minus 20db plus 22db.
Output Range: 0-10, 0-50, 0-100, 0-500, 0-1,000
Battery used: UM-3-1, 1 piece.
Dimensions: 3¼in x 4½in x 1⅛in.
Complete with internal battery, testing leads and prods.

PRICE $11

Including Sales Tax

Plus Postage, 35c.

TRANSISTORISED CALLING & TALKBACK SYSTEMS

BATTERY OPERATED

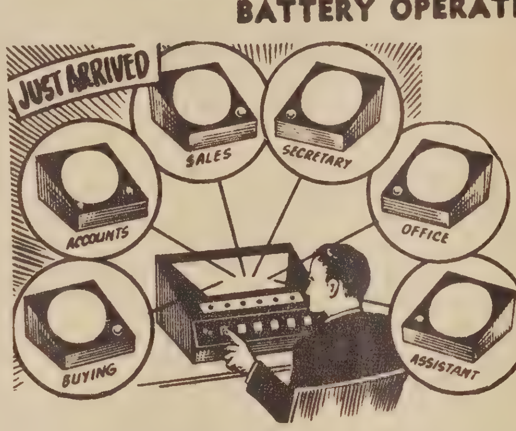


TABLE OR WALL MOUNTIN

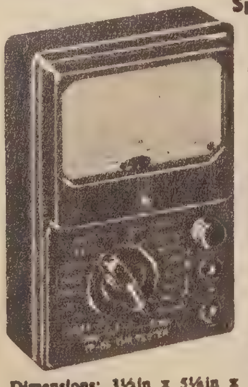
2 Station 1 Master Sub-station 1 x 9V Batts. **$15.75.**
3 Station 1 Master Sub-stations 4 x 1½V Batts., from **$18.**
4 Station 1 Master Sub-stations 6 x 1½V Batts. from **$24.**
5 Station 1 Master Sub-stations 6 x 1½V Batts., **$44.78.**
7 Station 1 Master Sub-stations 6 x 1½V Batts., **$54.**

Plus Postage.

MODEL TP-5S

- High sensitivity-20,000 Ohms/V DC, 10,000 Ohms/V AC.
- 3in Meter.
- Handy pocketable size.

Specifications:



DC Voltages: 0-10-50-250-500-1,000 V (20,000 Ohms/V).
AC Voltages: 0-10-50-250-500-1,000 V (10,000 Ohms/V).
DC Current: 0-50uA, 0-5-50-500mA.
Resistance: 0-10K, 0-100K, 0-1 Meg, 0-10-Meg. (62 Ohms, 620 Ohms, 6.2K, 62K at centre scale.)
Capacitance: 0.0001uF-0.005-uF, 005uF-1uF
Decibels: minus 20db to plus 36db in 2 ranges.
Dimensions: 3½in x 5¼in x 1⅜in.
Weight: 15oz approx.
Complete with internal battery, testing leads with prods.

PRICE $18

Including Sales Tax.
Plus Postage, 35c.

Capacitor Substitution Box, 1000 VW	$3.10
Resistor Substitution Box, 1 Watt, Plus Post, 20c.	$3.38

TRANSISTOR AERIALS

4in extends to 27in	$1.50
5in extends to 39in	$1.70
6in extends to 43in	$1.40
6in extends to 32in	$1.00
6in extends to 28in	95c
7in extends to 39in	$1.60
9in extends to 39in	$1.40
10in extends to 39in	95c

Plus postage, 15c.

LMI Crystal Mic. with 3.5mm plug. $1. Post free.

Crystal and Magnetic Earphones, 2.5mm plug. 50c. Post free.

Trans. Pri. 220, 240, 250, Sec. 218V Doubler at 270mA, 6.3V at 8 amp **$2.50.** Plus postage, **$1.**

Trans. Pri. 200, 220, 250. Sec. 275 275 at 80mA, 6.3V at 5A. **$2.50.** Plu postage **$1.**

Slide Rule Calculators, add, sub tract, etc., to six figures. **65c e** Post free.

Spiral indoor TV Antenna, **$1.9** Plus postage **50c.**

3AG Fuses 1 amp, **10c** pkt. of 5.
3AG Fuses 5 amps, **15c** pkt. of 5.
3AG Fuses 10 amp, **15c** pkt. of

TV REMOTE SPEAKER CONTROL $4.20

has inputs for earphones and one speaker with volume control. **Post 25c**

SYNCHROTAPE

100ft x 2½in	45c.	Post 10c
300ft x 2½in	$1.20.	Post 10c
1200ft x 5¾in	$2.50.	Post 15c
1800ft x 7in	$3.95.	Post 25c

CRYSTAL SET BUILDERS

Coils	60
Diodes	30
Headphones	$2.5
Tuning Conds	$1.6
Terms	10c e

1 Trans. Amplifier for crystal s circuit supplied.

Only $1.95

Plus Postage, 25c.

307 ELIZABETH STREET, MELBOURNE Phone 60-144

so that the clock provides its own indication to the constructor as to when the batteries require a replacement.

Torch cells will typically power the clock for about 18 months, cycle lamp batteries for up to two years.

The soft iron yoke (figure 7) has riveted to it two soft iron cores, the ends of which are shouldered down and are a driving fit in the holes drilled in the yoke.

For securing the electro-magnet in position, the yoke is drilled for two counter-sunk screws. Slipped over the cores are the bobbins, figure 9; on these are wound the magnetising coils.

The bobbins are easily built up from

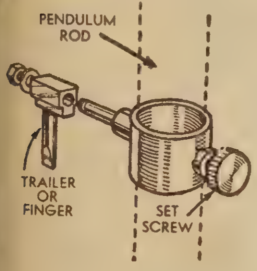


Figure 5—Vital to the operation of the clock is this trailer finger, which must pivot perfectly, smoothly and freely on the pin, protruding from the locking ring. (See Editor's note in text.)

hin brass tubes of a size to fit the ores, snugly, and are completed by soldering to the ends of the tube brass langes in which a hole has previously een bored for the insertion of the tube.

Before winding on the wire, wrap a ouple of turns of notepaper around the ubes, and brush well with shellac varnsh. To insulate the flanges, cut some iscs of paper, cutting the centre of the isc for the tube; cut through one side o that the disc can be placed on the obbin, and then brush well with arnish.

A couple of small holes may be rilled through one flange of each bobin for bringing out the ends of the coil.

Now proceed to wind on each bobbin s evenly as possible about 3½ ounces of lo. 30 single silk-covered wire; cottonovered wire may be used if at hand. e particularly careful not to reverse the irection of winding during the process.

When the coils are wound, slip them ver the cores and connect the finishing nd of one coil with the starting end f the other. The two remaining ends f the coils should now be connected to couple of dry cells to ascertain if ere are any breaks in the wire; also check the pull of the magnet with a iece of soft iron (figure 8).

Assuming the test is satisfactory, nish off the coils with a coat of some sulating varnish, and, to give a pleasg appearance, the coils may be covered ith a piece of black velvet.

Two pieces of steel or brass, E and F gure 13) are bent at right angles and illed with two holes for attachment to e back-board. Inserted between E and is a distance piece H, a shade thinner an the thickness of the brass at X, ure 3.

After trueing up the sides of E and coming against the piece H, the whole is drilled and riveted together, ensuring that the top and bottom edges of the bracket are square and parallel.

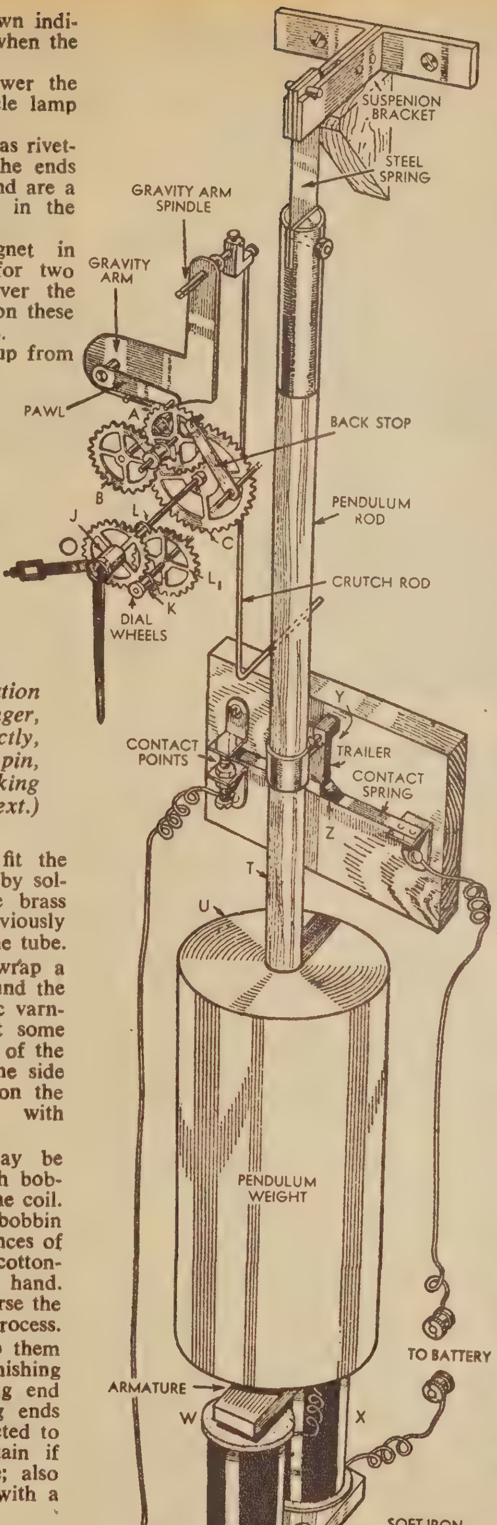


Figure 6—This diagram shows the layout of the completed clock. As explained in the article the wheel train may be portion of an old alarm clock, while the various small brackets can be built up with ordinary tools from scrap brass.

Carefully cut a V notch in the top edge of E and F to receive the suspension pin Q.

If necessary, file out the checks of the bracket until the brass blocks of the suspension spring are a snug fit, and will permit the pin Q to rest in the notches.

For the armature (figure 11) use a piece of soft iron. A centrally drilled hole is tapped to suit the screwed rod attached to the end of the pendulum rod, and is locked in position by a nut. It is as well to anneal the iron by allowing it to remain in the fire overnight.

The pendulum is built up; the main portion consists of a piece of half-inch wooden curtain rod, the ends being fitted into two pieces of brass tube.

One such tube is closed at one end with a piece of brass rod, slotted to receive the suspension spring (figure 3), a small bolt and nut being the means of attachment.

The rod is reduced to fit into the tube and a couple of small holes are drilled through the whole to receive rivets made from soft wire.

The second tube is attached to the rod in a similar way, but, before attachment, a quarter-inch brass collar (or nut filed down) is driven into the end of the tube and soldered; screwed into the collar is a piece of threaded rod, to carry the timing nut and the armature. Sliding freely over the second tube is the bob, which should weigh from 10 to 15lb, and may be of iron or lead.

Figure 3 shows the method of attaching the suspension spring to the brass chocks by small rivets.

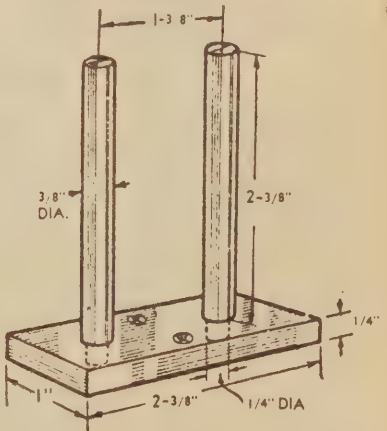


Figure 7—Details of the core for the electromagnet. This must be made from soft iron, not steel.

Use steel ribbons or "feeler" blade steel for the spring, which should be from 3/1000in to 5/1000in in thickness.

The ends of the spring should be a good fit in the suspension bracket and the end of the pendulum respectively; the upper end of the spring has a pin Q that normally rests in the notches of the bracket.

The length of the pendulum is measured from the bottom of the bracket to the centre of the bob; any slight error in length is easily corrected by altering the position of the bob by means of the timing nut.

NOW IS THE TIME TO PLAN

YOUR TELEVISION INSTALLATON

USING

ACME

TELEVISION ANTENNA CONNECTORS

C22-119 pack.

AVAILABLE FROM

ALL LEADING RADIO AND TELEVISION HOUSES

IN AUSTRALIA & NEW ZEALAND

MANUFACTURED IN AUSTRALIA BY

ACME ENGINEERING COMPANY PTY. LTD.

132 BURWOOD ROAD, BURWOOD, VICTORIA TEL. 285511

YOU MAY WIRE 2, 3 OR 4 ROOMS FROM 1 ANTENNA USING ACME SPLITTERS

Please write for details of the complete range.

AUSTRALIAN SOUND AND TV CO. PTY. LTD.

35-39 YARRA BANK ROAD, SOUTH MELBOURNE

61-3024 TELEGRAPHIC ASSOUND. MELBOURNE 61-3192

Manufacturers and designers of the most reliable commercial amplifiers available today. Any of our stock amplifiers will meet any standard Government Specification. Each individual amplifier is custom built. Our 250/300 watt units were selected for the Qantas project in Sydney in competition with American counterparts. All amplifiers can be purchased tropicalised.

3/5W	**$42**
12/15W	**$62.62**
30/40	**$77.50**
60/70	**$98.30**
100/120	**$113.30**
250/300	On application

Complete with Hi Imp input and tone control Pick-up input and tone control, 100 V line out. Tax 12½% unless to be used for Music purposes then 25% 50 ohm input with Mu Metal transformer mounted on chassis—$15.25 additional.

Transistor amplifiers.

A.S.T.—5/12 W, **$28** to **$42** plus 12½% sales tax.

A.S,T. 30/40 W Guitar amplifiers, **$180** plus 25% sales tax.

A.S.T. Transistor amp 5W—V/C out **$28.**

A.S.T. Transistor amp 10W—V/C out **$40.**

Tax 12½%.

A.S.T. Radio tuners from **$10.**

DEMONSTRATORS P.A.
SYSTEM

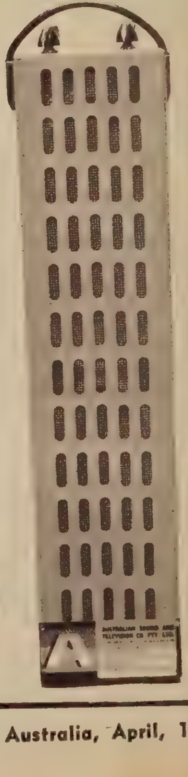
ITS

- Transistorised
- Will efficiently cover 500 people.
- Works off Torch Batteries
- Printed Circuit
- The most advanced self-contained P.A. System available

Can be supplied with Neck Microphone, Cardoid Microphone Telescopic Stand.

Price as per illustration
With Dynamic Microphone
$62.50. Tax $7.81

PACKING and FREIGHT
EXTRA



Referring to figure 5, a piece of steel wire is flattened at one end, the other being driven into and soldered to a small block; the latter has a hole drilled at right angles to the wire to take the pin carried by the pendulum fitting.

The whole fitting should be as light as possible; to reduce wear the flattened end of the wire should be filed to a point and hardened.

To support the finger, the special fitting (figure 5) will have to be built up. This consists of a piece of thick tube to fit the pendulum rod T freely, and on opposite sides of the tube are soldered two bosses; these are drilled and tapped to receive respectively the milled screw and the pin.

The screw provides for adjustment of the finger up and down the pendulum rod relative to the contact-maker.

It is essential that the constructor understand exactly the function of the trailer finger, and a further explanation at this point may be warranted.

The block carrying the wire finger must pivot freely on the pin; the nut and washer shown in figure 5 are merely to keep the block in place. They should be tightened up just enough to prevent undue longitudinal movement of the block on the shaft, and, if necessary, fixed in this position with a second lock nut. The block should be oiled so that it will revolve quite freely on the pin.

When finally set up, the pin should drag freely over the wedge-shaped block (figure 12) while the pendulum bar is swinging freely. The pin simply drags to one side or the other across the wedge block without exhibiting any tendency to press it down.

However, as the amplitude of the pendulum swing gradually decreases, the finger will sooner or later fail to clear the wedge block and the tip of the finger will momentarily come to rest above the nick in the top of the block, when the pendulum has reached the extreme of its travel.

Immediately the pendulum starts back in the opposite direction, the tip of the finger will be forced into the top of the wedge block; then, as the pendulum continues its forward movement, the block will be forced down, closing the contacts to the electro-magnet.

The finger then disengages the block and does not come into action again until the amplitude of the pendulum swing reduces to the predetermined minimum.

(EDITOR'S NOTE: Following publication of the original article, a number of readers queried the wisdom of using a trailing finger made up as described above. They stressed the difficulty of ensuring completely free movement of the finger, particularly if the lubricant used tended to become gummy, after a while. One suggestion was to grind the shaft at the centre to reduce the bearing surface. The method most favoured, however was the use of needle-point bearings, either made up for the purpose or adapted from a clock balance wheel mechanism, or from an old auto speedometer or meter gauge.)

To reduce the amount of work and the tediousness of the building up the wheel-work, necessitating the correct pitching of the holes for the pivots of the various arbors, it is proposed to utilise the movement of an alarm or other clock.

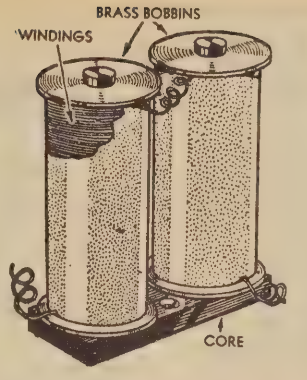
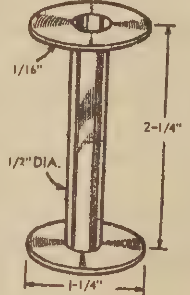


Figure 8—The complete electro-magnet assembly.

Figure 9. Details of the magnet bobbin, which can be made up from brass tubing as suggested in the article, or from impregnated card of the type used in transformers.



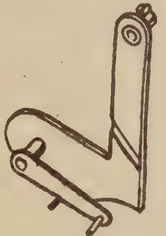


Figure 10. One of the most critical pieces in the whole clock is the gravity arm and driving pawl, which transmits the movement of the pendulum to the wheel train.

If the movement has a seconds hand, remove all the wheels in the alarm train, then remove the "balance wheel" and "escapement"; after that, the large wheel carrying the main spring of the going train.

If a ¾ seconds pendulum is used, its length will be 22in, and the number of teeth in the ratchet wheel will be 40, since a ¾ seconds pendulum makes 80 swings per minute.

On the other hand, if a long or seconds pendulum is preferred, with a length of 39.12in, the ratchet wheel will have 30 teeth.

Frequently, on counting the number of teeth on the highest driven wheel of a movement, they will number 40, which is suitable for a ¾ seconds pendulum.

In this case, it is not absolutely necessary to substitute a ratchet wheel of 40 teeth, but the driving pawl will have to be carefully shaped to fit the teeth of the wheel. If it is decided to replace the wheel by a ratchet wheel with either 30 or 40 teeth, a piece of sheetbrass may be used in its construction.

The length of the pendulum will not affect the other details of the clock, which can now be considered in detail.

To support the arbor carrying the gravity arm, it will be necessary to rivet or bolt to the frames two brass strips (figure 2). These are tied together at the upper ends by a length of 2BA threaded rod F; a piece of tube slipped over the rod serves as a distance piece when the nuts are screwed up.

Viewing the movement from the back, it will be advisable to remove the top right-hand pillar originally fitted for keeping the frames the correct distance apart.

Holes are drilled in the brass strips to take the gravity arm arbor.

Because, clock frames vary in size, it may become necessary to modify slightly the dimensions, but no great difficulty will be experienced.

This component is readily made from a piece of sheet brass and should be of ample proportions to have the required weight to propel the ratchet wheel.

The exact dimensions will depend largely on the dimensions of the clock movement, but the accompanying diagrams give a fair idea of the relative sizes.

The upper end should be fitted with a bush with an internal diameter such that it can be slipped over and locked to the arbor carrying crutch rod. The other end of the gravity arm needs to be fitted with a pin to carry the driving pawl.

The pawl itself can also be built up from brass strip, with a piece of tube serving as a bush. This must ocillate freely on the pin fitted to the gravity arm.

A pin is then fitted to the free end of the pawl, in such a position that it will engage the teeth of the 30 or 40 tooth wheel mentioned earlier. The tip of this pin needs to be carefully shaped so that it will slip freely from the teeth in the one direction, but will nevertheless give positive drive in the other.

The requiremens of the back stop are

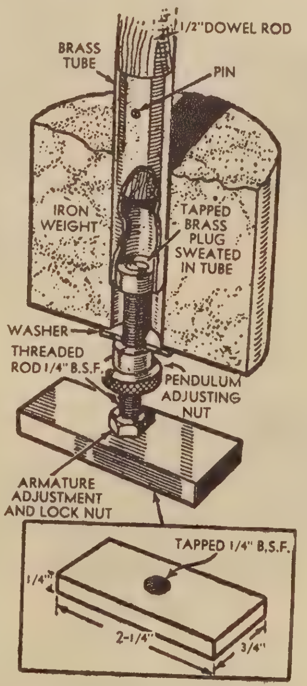


Figure 11—Details of the armature and pendulum bob. Lowering the weight increases the effective length of the pendulum and reduces the frequency of swing. Pendulum length is reckoned from the point of suspension to the centre of the bob.

Special Bargains from
RADIO HOUSE PTY. LTD.

"SUNRICH" PORTABLE 5 TRANSISTOR TAPE RECORDER

Model 999A $31.50 (£15/15/-)

Plus post., 75c.

Reduced from £22/10/

Complete with Tape Battery Phone and Mike

SPECIAL PURCHASE

Set of three posted $3.75

CHROME VAN

German screwdriver and pocket tester.

1. 6-12 volt model auto tester.
2. Sparkplug tester.
3. 110-380 Volt mains tester.

$1.25 each

MULTIMETER TESTERS

Model RH-50

Modern Design, 33 Micro Amp Meter.

30,000 Ohms per Volt D.C.

13,000 Ohms per Volt A.C.

1 p.c. Multipliers and Shunts used. Printed circuit.

Clear Scale, rugged moulded case.

SPECIFICATIONS

DC Voltages: 0-0.3-1.2-3-12-30-120-300-600-1,200 V at 30,000 Ohms per volt.

AC Voltages: 0-3-12-30-120-300-600-1,200 V at 13,000 Ohms per volt.

DC Current: 0-.06-6-60-600 mA, 0-12 A.

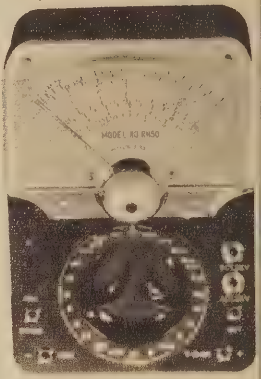
Resistance: 0-60K-6M-60M (350, 35K, 350K at mid-scale).

Decibels: minus 20 to plus 57 dB (0 dB equals 1 mW. 600 ohms).

Audio Out: Capacitor in series with AC volt ranges.

Short Test: Internal buzzer.

Accessory: 1 pr. heavy test leads.



Price $31 (£15/10/

Postage 50c to $1 extra.

Batteries: 1 (1.5V), 1 (15V),

Size: 3 5-16" x 6 5-16" x 2¼

Weight: 1.4lb approx.

LIMITED STOCK ONLY

Model RH-10

RANGES:

DC Voltages: 0-10-50-500-1,000 V at 2,000 Ohms V.

AC Voltages: 0-10-50-500-1,000 V at 2,000 Ohms V.

DC Current: 0-500uA 0-500 mA.

Resistance: 0-10K-1 Meg: 60 ohms, 6 Kohms at centre scale.

Capacitance: 250uuF to 1uF, in two ranges.

Decibels:—20 to plus 36db, two ranges.

Output: 0-1,000 V in four ranges.

Size: 5in x 3½in x 1½in.

Weight: 13oz approx.

Price $10.75 (£5/7/6)

Postage 50c to $1 extra.

Model RH-5

- High sensitivity-20,000 Ohms/V DC, 10,000 Ohms/V AC.
- 3in Meter.
- Handy pocketable size.

SPECIFICATIONS

DC Voltages: 0-10-50-250-500-1000 V (20,000 Ohms/V).

AC Voltages: 0-10-50-250-500-1000 V (10,000 Ohms/V).

DC Current: 0-50uA, 0-5-50-500mA.

Resistance: 0-10K, 0-100K, 0-1Meg, 0-10Meg. (62 Ohms, 620 Ohms, 6.2K, 62K at centre scale).

Capacitance: 0.0001uF-0.005uF, 0.05uF-1uF.

Decibels: minus 20db to plus 36db in 2 ranges.

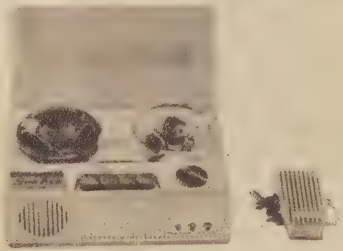
Dimensions: (3½" x 5½" x 1½").

Weight: 15oz approx.

Complete with internal battery, testing leads with prods.

Price $18 (£9/0/0)

Postage 50c to $1 extra.



PORTABLE TRANSISTOR TAPE RECORDER

"SUNACE" PD 401

$21.00 (£10/10/-)

Postage 75c (7/6)

Complete with Mike, Battery and Tape.

MODEL TP-5 POCKET VOM. TESTER

RANGES:

- DC Voltage: 2,000 OHMS per VOLT 0-5-25-100-250-1000 Volts.
- AC Voltage: 2,000 OHMS per VOLT 0 - 5 - 25-100-250-1000 Volts.
- DC Current: 0-500uA, 25uA, 500mA.
- Resistance: 0-20K, 0-2Mg, OHMS.
- Capacitance: 500uuF to 0.1uF at 100V AC, 0.01uF to 2uF at 5V AC.
- Decibels: minus 20 DB to plus 48DB in 5 ranges.

£5-17-6

$11.75

CAR, CARAVAN LIGHT FITTING

Auto light with switch fits any car, plugs into cigarette lighter socket. 6 or 12 volt available

$3.75 Posted

SPECIAL OFFER
ALL TRANSISTOR MANTLE RADIO
$11.95 (£5/19/6) Postage 50c

RADIO HOUSE PTY. LTD.

306-308 PITT ST., SYDNEY. Also at 760 George St. and 6 Royal Arcade.

PHONE 26-2817

similar and figure 4 illustrates both cases.

When the units are assembled a second pin should be fitted to the gravity arm in such a position that it will limit the fall of the pawl and allow the latter to pick up only one tooth at a time. This is clearly shown in figure 10.

The contact maker takes the form of a light spring, riveted at one end to a brass bracket, screwed to a wooden or ebonite base. The free end of the spring is provided with a contact engaging with an adjustable contact carried by another bracket.

To restrict the play of the spring, an adjustable stop is introduced; thin strips of leather, etc., may be glued to it to silence the action when the spring is released.

The spring should not be too stiff, otherwise in depressing it a lot of unnecessary work will be thrown on the pendulum.

Riveted or otherwise mounted on the spring is a small wedge-shaped block; the latter has a small nick out at one end for the entry of the point of the finger.

The baseboard should be provided with slotted holes for adjusting purposes.

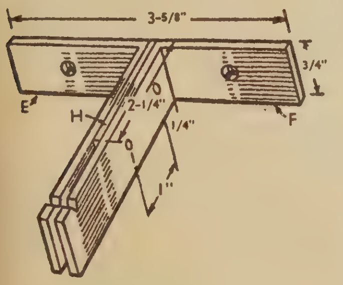


Figure 12—Details of the support bracket for the pendulum. The top block of the suspension spring should be a snug push fit, the pin resting in the V-cuts.

The connecting link between wheelvork and pendulum is the clutch rod figure 2). To render the rod adjustible up and down the pendulum as well is on the gravity arm arbor, a small itting (as in figure 2) will suit all requirements.

This part is cut from a block of brass ind has two holes drilled at right angles o take the arbor and the lever respectvely; topped holes receive set screws or locking purposes.

The design of the hands and the dial re left to the constructor's taste; the ormer should be fairly light and corectly fitted to the movement. The dial nay be of cardboard, brass, etc., and bout 7in across.

There are various ways of mounting ne dial. One is shown in figure 2, hich shows the dial secured in position y metal brackets soldered to the block nit.

All the components are erected on a ibstantial backboard, so that the whole iay ultimately be placed in a suitable ise; the batteries may also be housed the bottom of the case. The clock ame is attched with brackets to the ackboard.

The backboard should have drawn on a centre line, and is then hung up or set so that the line is truly vertical. Screw the pendulum suspension bracket to the top of the board so that the pendulum hangs in front of the line on the board.

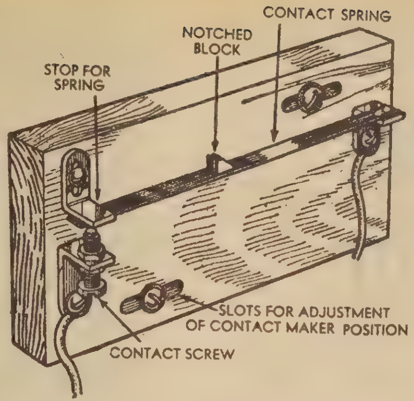


Figure 13—Application of the proper driving impulse to the pendulum depends on the operation of this contact maker.

Next place the electro-magnet in position so that the cores are central with and about 1/16th-inch below the armature; the gap can be reduced to a minimum later by packing up the magnet with a piece of cardboard. The magnet is best supported by a bracket or shelf.

The position of the contact-breaker is found by experiment, mounting its baseboard a little above the mid-position of the pendulum rod. The rod should hang vertically at the time and the board set so that the nick in the steel block is on the left of the finger.

Now lower the finger attachment on the pendulum until the former is about 1/16th-inch below the block. A little experimenting will be necessary to get the best results, raising the finger may be necessary if the spring is depressed more than, say, 1/32nd-inch.

Thereafter it is simply a matter for experiment to get the clock into accurate operation. Once the proper position for the contact maker and electromagnet has been determined, the remaining adjustment is that of the pendulum bob.

This can be adjusted roughly at first by counting the strokes and comparing with the second hand of a watch. Thereafter the clock can be regulated to another accurate timepiece and ultimately brought into line with the time signals.

Some experimenting may be desirable, too, with the voltage applied to the energising coils or, alternatively with the coils, to bring them into line with some source of voltage to hand.

Editor's Note: Following original publication of this article, points raised by correspondents included the following:

(1) Use of needle bearings for the trailing finger, as already mentioned in the text.

(2) The clock cabinet must be heavily and substantially built, otherwise it will tend to weave or rock with the swing of the heavy pendulum, so that the latter ceases to be the only determining factor in the timing cycle. If the cabinet can be bolted to a wall, so much the better.

(3) Constructors should be careful not to lubricate the clock mechanism with any oil which merely looks light enough. Try to obtain a non-gumming type of oil, as used by watch and clock repairers. In fact, a small quantity may be obtained from same for the purpose. Medicinal paraffin oil may be obtained from a chemist and is also very good.

(4) Because of the pulsed nature of the pendulum drive, the magnet system may conceivably be energised by a 6.3 volt transformer with primary energised continuously from the mains. If this is done, be sure to use a type which has a low magnetising current and which, preferably, will not turn the meter on its own.

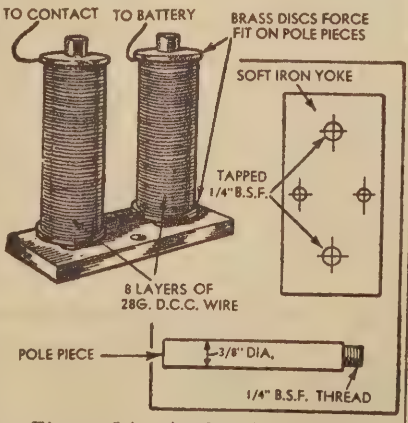
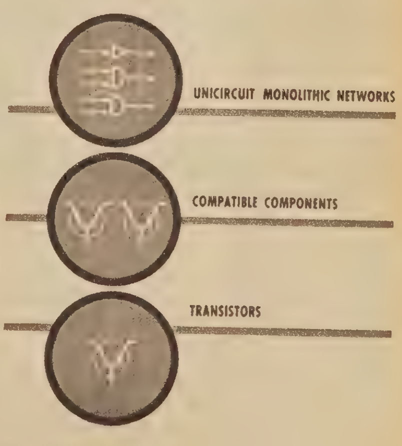


Figure 14—A slightly different electromagnet arrangement which one reader found to give a better impulse to the pendulum than the original design.

SPRAGUE
THE MARK OF RELIABILITY



Sole Australian Representative

D. R. Johnston and Co. Pty. Ltd.
Suite 14, "Stanhill 33",
Queens Road, Melbourne.

TELEPHONE 26-1381—TELEGRAMS & CABLES "VIATON", MELBOURNE

An Extraordinary 2-c to 2-Mc Oscillator by

MILLION - TO - ONE FREQUENCY RANGE

Distortion is less than 0.25% from 50 c/s to 50 kc/s, even at full output and under short-circuit conditions.

Frequency characteristic is flat within ± 2% from 20 c/s to 200 kc/s.

Output is over 20V into open circuit, 160mW into 600 ohms.

Transistorised, capacitance-tuned RC Wien-bridge oscillator and power supply are completely contained in a 8" x 6" x 8" package. These features make the new GR Type 1310-A Oscillator an outstanding instrument for day-to-day applications. But, what definitely puts this oscillator in a class by itself is an entirely new feature by which its frequency can be synchronised with an external signal. Also, the oscillator can itself be used to furnish a sync signal to other equipment. Thanks to this sync provision, unique in an inexpensive oscillator, the new Type 1310 has a much wider range of application than the ordinary oscillator.

In a nutshell, the 1310-A now brings the small size, mechanical ruggedness and reliability of transistorised circuitry to a wide-range, general purpose instrument. If offers all the benefits you expect in a modern, two-feedback-path RC oscillator including high accuracy and infinite resolution of variable capacitance tuning — plus the new frequency-synchronisation provision — all at a surprisingly low price.

Here are Some Uses For Oscillator Synchronisation:

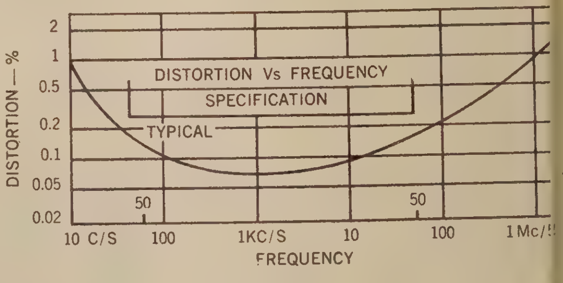
As a tracking narrow-band filter to reduce hum noise, and distortion in a signal; a source of amplitude-modulated signals; an automatic phase-controlled oscillator to reduce frequency modulation or jitter; a single-frequency leveling amplifier; a phase-locked, sinosoidal frequency multiplier; a phase shifter; a narrow-band isolation amplifier; an amplitude-modulation filter.

FREQUENCY

Accuracy: ±2% of reading.
Stability: Typical drift after warmup.
0.001% short term (1 min.) at 1 kc/s
Synchronisaton: Jack provided for externa phase-locking signal. Locking range is abou ±3% for 1-V rms, input reference signal ove entire 2-c to 2-Mc range. Locking ranges u to 40% can be used.

OUTPUT

Voltage: Over 20V, open circuit, continuousl adjustable attenuator (approximately 50 dB)
Amplitude Stability: Typical drift after warmu 0.02% short term (1 min.).
Impedance: 600 ohms.
Distortion: As indicated. Hum less than 0.02% independent of attenuator setting.
Synchronisation: High-impedance, constant amplitude 0, 8 V, rms, output for use wit oscilloscope, counter or other oscillators.



GENERAL

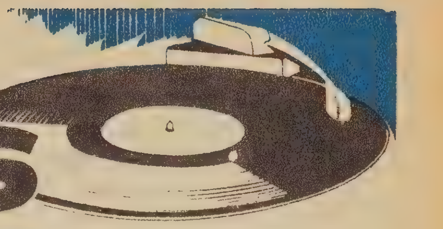
Power Required: 105 to 125, 195 to 135, o 210 to 250V, 50 to 400 c/s.

For full technical information and all details, contact your nearest office of:

WARBURTON FRANKI

ADELAIDE: 204 Flinders Street, 233-233.
BRISBANE: 13 Chester Street, Fortitude Valley, 51-5121.
CANBERRA: Post Office Box 750, Canberra City, A.C.T., 4-775
MELBOURNE, 220 Park Street, South Melbourne, 69-0151.
MOUNT GAMBIER: 92 Penola Road, 23-841.
NEWCASTLE WEST: 844 Hunter Street, 61-4077.
SYDNEY: 307 Kent Street, 29-1111.
WOLLONGONG: 140 Kiera Street, 2-5444.
HOBART, LAUNCESTON: Associated Agencies Pty. Ltd.

AUDIO TOPICS



Cabinets for Transistor Amplifiers

With designs for high-quality transistorised stereo Control Units and power amplifiers now published in this journal and others, it is natural that the question of suitable cabinets be re-examined. Although initial consideration of the reduced bulk and heat dissipation of transistorised circuitry would lead one to expect that cabinets might be made somewhat smaller than for valve equipment, the extent to which this will in fact be true depends upon a number of factors.

by Jamieson Rowe

Not the least important of these factors is the heat problem. While it is true that transistorised equipment is (usually) markedly more efficient than valve equipment and hence has a much lower heat dissipation for a given output, transistors themselves tend to be a good deal more sensitive than valves to temperature change. This is true more of the older germanium transistors than of the silicon type now coming into vogue, although silicon transistors are by no means insensitive to temperature change.

Unless adequate provisions for heat dispersal are made, then, the advantages of reduced heat dissipation in transistorised equipment tend to be offset by the increased sensitivity of the equipment to temperature rise. Thus if a compact cabinet is desired the question of "adequate provision for heat dispersion" must be investgated.

In transistorised audio equipment the primary sources of heat dissipation are the output transistors and the power supply components such as the power transformer and rectifier diodes. With careful design the dissipation of the latter components can be kept to a low value, sufficiently low that a moderate degree of convection cooling is adequate to prevent substantial temperature rise within a small cabinet. However, the dissipation of the output transistors will usually be quite high—at least under signal conditions—and this can pose problems.

The output power transistors are in most cases mounted on finned radiator blocks which, despite their name, depend mainly upon convection cooling via air currents. If these blocks are to operate efficiently in keeping the output transistors cool, it should be possible for air to move freely past the fins. And if the air temperature in the equipment cabinet is not to rise appreciably, the air which moves past the fins should not be the same air which fills the cabinet—unless there is a continuous replacement of air in both cases.

There appear to be three ways of solving the heat problem and, as with some of the other factors to be discussed, the method which will be "the answer" for a particular constructor will depend upon such things as available space, equipment bulk and disposition and personal preference. There is no universal solution.

The first of these procedures involves the use of an open-backed cabinet. This will usually ensure that cabinet air is continuously replaced, and that there is a continuous flow past the transistor cooling fins. However, an open backed cabinet is not always the most attractive proposition, particularly where the cabinet must be free-standing rather than with its rear facing a wall or room divider. Moreover an open back invites inquiring fingers and tends to encourage excessive ingress of dust.

The second method is to enclose the equipment in a cabinet which is provided with highly efficient convection—or occasionally, forced air—cooling. There is still a continuous flow of air through the cabinet and past the transistor cooling fins, but its entry to and exit from the cabinet is made via vents. The difficulty here is to design the vents so that both in themselves and in their placement they combine attractiveness with efficiency.

The third method and the one which the author at this time tends to favour involves a convection cooled cabinet but with the output transistors and their finned blocks mounted on the outside at the rear. The philosophy behind this approach is that with the main source of heat dissipation outside the cabinet it proves easier to provide the small amount of convection cooling required for the rest of the equipment; in addition the power transistors are ensured the efficient cooling which they must have if the equipment is to operate reliably for long periods of time.

Perhaps the main objection to this approach is that it involves placing the output transistors and their finned blocks where they may be seen and/or touched.

As the majority of transistor output stages operate from quite low supply voltages the risk of shock from contact is almost negligible. However, the problem of appearance remains in cases where the finned transistor blocks are not thought to be attractive.

In such cases it should be possible to arrange wrap-over masking plates to conceal the transistors and blocks without markedly reducing the flow of air.

Another important factor which must influence the choice of an equipment cabinet and its size is hum radiation from motors and power transformers. As equipment is compressed into smaller and smaller cabinets, preamplifiers and other low-level signal handling circuitry generally find themselves moved into closer proximity to turntable motors, tape deck motors and power transformers with their inevitable stray fields. Unless great care is taken this will result in embarrassing hum induction.

In general there are two ways of reducting hum induction, and in many cases both must be used to some extent. One is reduction of the stray fields themselves, at their origin; the other is the shielding or other arrangement of low-level circuitry so that it becomes relatively impervious to stray fields.

The first of these is mainly in the hands of the component manufacturer, in the provision of low-leakage motors, integral shields in his turntable or tape deck, and so on. However where a motor is unduly ambarrassing in this regard it is sometimes possible to fit it with a home-made shield made from iron or perhaps (if money is no problem) mumetal.

Similarly while transformer manufacturers are usually able to supply low-leakage units either as standard lines or to special order, if a high-leakage type must be used it is sometimes possible to fit a home-made shield.

The second way of reducing hum induction is more under the control of the designer and constructor. Firstly, they can position the equipment within the cabinet or even place them in separate cabinets so that low level circuitry is as far as possible removed from the hum fields. And in addition they can use shielding, balanced circuitry and hum cancellation techniques to render the circuitry as insensitive as possible to the fields.

Most Control Units are inherently shielded because of the steel case enclosing the circuitry. Similarly the majority of better-class pickup cartridges and —to a lesser extent tape heads—have a

Reader's Digest & RCA *present*

50 LATIN-AMERICAN FAVOURITES for LISTENING and DANCING

Let's Go Latin

Here is all the pageantry and color of Latin-America, as expressed in the Bossa Novas, Cha-Chas and Tangos, Mariachis and Marimbas of the American tropics, newly recorded in sound of unbelievable clarity and brilliance. This set was specially recorded for Reader's Digest in Mexico to capture the "feeling" of this exciting music.

50 Latin-American Favorites for Listening and Dancing

ALL FOUR RECORDS FOR ONLY **$9.99** (You Save $11.01 on retail prices)

Only $3.99 Deposit *after 10 days free trial*, balance in 2 interest-free instalments.

PLAY THEM FOR 10 DAYS FREE

SEND NO MONEY. To receive your set for 10 days free trial, simply complete the coupon below and mail, without money, to Reader's Digest, Box 65 G.P.O., Sydney

The Reader's Digest Association Pty. Ltd.
Box 65, G.P.O., Sydney, N.S.W.

I accept your offer. Please send me one set of "Let's Go Latin" for ten days free trial.

☐ Tick (✓) here for **STEREO** records.

NAME.........

ADDRESS.........
PLEASE PRINT

.... STATE.........

I understand that I may return the set if not completely satisfied and owe nothing.

P21-EL

Here are the exciting contents of this delightful 4-Record Set:

GOLDEN HITS FROM LATIN AMERICA

Perhaps, Perhaps, Perhaps • The Girl from Ipanema • Bahia • What a Difference a Day Made • Siboney • Brazil • Desafinado • One Note Samba • Copacobana • Cae Cae • Meditation • Brazil Moreno.

DANCING IN THE LATIN MANNER

Negra Consentida • Cachito • Nereidas • La Mucura • La Ultima Noche • El Baile Del Pincuino • Moliendo Café • Campanitas De Cristal • Banana Boat Song • Corazon De Melon • Palabras De Mujer • Mi Cafetal.

A TROPICAL SERENADE

Vereda Tropical • Sin Ti • Maria Elena • Nunca • Silencio • Marta • Noche De Ronda • Perdon • Green Eyes • Inspiration • Lagrimas Negras • Cuando Calienta El Sol • Sombra En Los Medanse.

THE ROMANTIC TANGO

Adios Muchachos • Clavel Del Aire • A Media Luz • El Choclo • Caminito • Nostalgias • Volver • La Raspa • La Sandunga • Las Altenitas • Las Chiapanecas • La Adelita • Dios Nunca Muere.

measure of internal shielding. It is the interconnection leads which can often pose the biggest problems.

In cases where the leads cannot be kept away from hum fields it sometimes proves necessary to employ twin-shielded cables, with both active and "earthy" leads shielded by an outer braid which is earthed at one end only to prevent any induced voltages from appearing in series with the signals. However careful connection of common earths to prevent hum loops will usually be sufficient to prevent trouble.

A third factor which must influence the size of an equipment cabinet is what might be termed the "bulk and disposition" of the equipment itself. To a very large extent this factor is determined by the preferences of the constructor/user and the intended location and use of the equipment.

To illustrate what is meant here, consider two rather different hypothetical constructors and their requirements: Mr A. has a large house with a large room to devote almost exclusively to his stereo system, lots of money and a flair for impressing his friends; Mr B. on the other hand lives in a flat with a small lounge/music room, hasn't too much money to spare for a stereo system, and perhaps feels that a stereo system should be heard and not seen.

Depending upon their auditory discrimination these two enthusiasts might choose widely differing systems and cabinets. Mr A. might elect to build or buy two large speaker inclosures and place them on either side of an impressive Georgian-style cabinet, where size of equipment will prove no problem; but he might alternatively elect to build the most compact equipment cabinet he can manage, team it with two "baby" speaker enclosures and impress his friends with a dramatic such-a-lot-from-such-a-little effect.

Similarly Mr B. might build turntable, amplifiers and speakers all into a 3-to-6ft long cabinet, free-standing or shelf or table mounted, taking this as the easiest way out. Or if he is a little more anxious to obtain optimum stereo effect, he might build the turntable and amplifiers into a small table-top cabinet used in conjunction with a pair of small but high-quality Bookshelf-style speaker enclosures. If hum proves a problem, a variation of the latter might be to fit the turntable and Control Unit section into the table-top cabinet and place the power amplifiers into one of the speaker enclosures—a practice which has gained some favour overseas.

Fairly obviously, there is no such thing as the universal answer to the cabinet question; almost every constructor will have his own equipment combination, proposed disposition and preferences. It remains in this short article for us to give details of a small cabinet design which may prove suitable for adaption to the requirements of those constructors who have built transistorised equipment and would like to house it in reasonably compact form.

The cabinet design shown in the diagram was developed with the idea that it would be of a size and shape suitable for table-top or wide shelf operation while having sufficient volume to cater for a fairly wide selection of turntables, changers, Control Units and amplifiers. Naturally one cannot hope to arrive at a single cabinet design which will cater for ALL such combinations, as turntables and changers alone vary quite widely in their bulk and shape; however, we have arrived at a cabinet design which should prove quite versatile in this regard.

The cabinet has external dimensions of 20in x 15½in x 10in, and is made from 3/8in or ½in plywood veneered and finished to suit the individual constructor. The main section is 7in high, not including a 3/16in dust trap strip, while the lid is 3in deep. The motor board is screwed to cleats so that its top surface is 1-5/8 in below the top of the dust trap.

A compact cabinet design suitable for housing a record player or changer, together with either a complete transistor amplifier or a Control Unit only. The dimensions are given overleaf.

The 20in x 15½in dimensions of the cabinet have been arrived at as about the smallest dimensions which allow a variety of turntables and changers to be mounted comfortably on the motor board alongside our standard Control Unit. The vertical position of the motor board and the specified lid depth give approximately 5in below the motor board and 4in above it; these values being selected as appropriate clearance both underneath and above most players, changers and Control Units.

In cases where a changer or player has excessive depth beneath the motor board the latter could of course be raised by shifting the cleats or fitting additional cleats. However, lowering the motor board will probably not be possible because of the depth required for the control unit and amplifier; in such cases a deeper case will have to be used.

The dimensions of this cabinet design will permit two alternative equipment arrangements: one in which the complete amplifier system is mounted in the cabinet with the turntable/changer; or one in which the Control Unit only is mounted with the turntable, the main amplifiers and power supply being mounted in an unobtrusive corner or in one of the speaker enclosures.

If the first of these alternative arrangements is selected, the main amplifiers and power supply will have to be made into a suitably flat form. A form such as that used in the "Twin-Five Watt Class-A" amplifier described elsewhere in this issue suggests itself as being suitable; the chassis format used for our own Playmaster 113 amplifier is less suitable because of the additional height provided by the chassis. For fitting into this cabinet the 113 could well be built up in the same form as the lower power amplifier, on a simple "L" bracket.

As mentioned earlier the recommended method of solving the heat problem is to mount the power transistors and their finned blocks on the outside rear of the cabinet, together with the mains cord entry, speaker connectors, tape and tuner input connectors and so on. With care the finned blocks and connectors can be made quite businesslike if not perhaps attractive, and in many cases this will be a practical arrangement as the cabinet rear will face a wall or divider. Otherwise a cover plate may be fitted, if this is arranged to permit adequate air flow past the fins.

The interior of the case will still require moderate convection cooling, as the turntable/changer motor and power supply components will get rather warm with extended operation. However mounting the cabinet on rubber feet and providing plain or suitably embellished vent holes in the bottom and rear of the cabinet should be quite satisfactory.

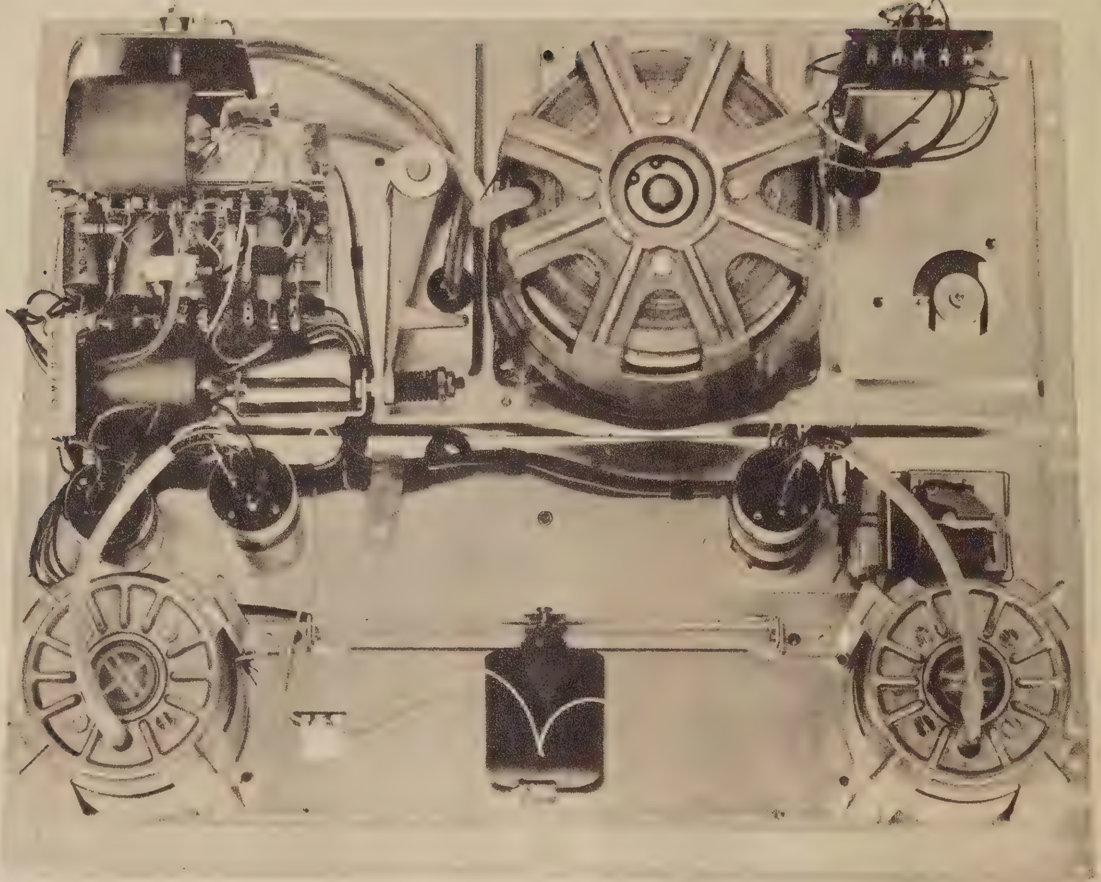
The second of the alternative arrangements will probably involve fewer problems as the power amplifier does not have to be fitted into the cabinet. It will still be necessary to provide moderate convection cooling, however.

Perhaps the most attractive possibility with the second method is that of fitting the power amplifier and power supply into one of the speaker enclosures. This is quite in order, but two points should be considered before this is contemplated.

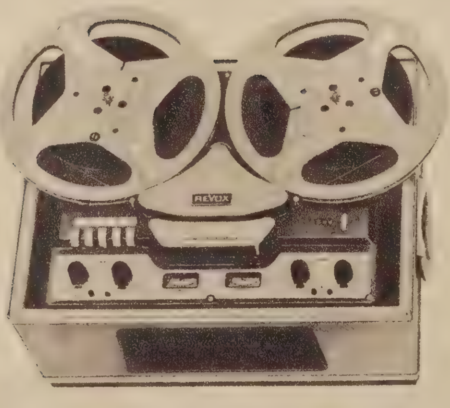
The first of these is the volume occupied by the equipment, which in most cases will be something like 0.5 cubic feet. Fitting the equipment inside an enclosure would be equivalent to subtracting this volume from the enclosure, so that in some cases the enclosure would have to be made a little larger than originally designed.

With the larger type of enclosure this

Three motors



N.A.B. Spool centres are now available for the REVOX.



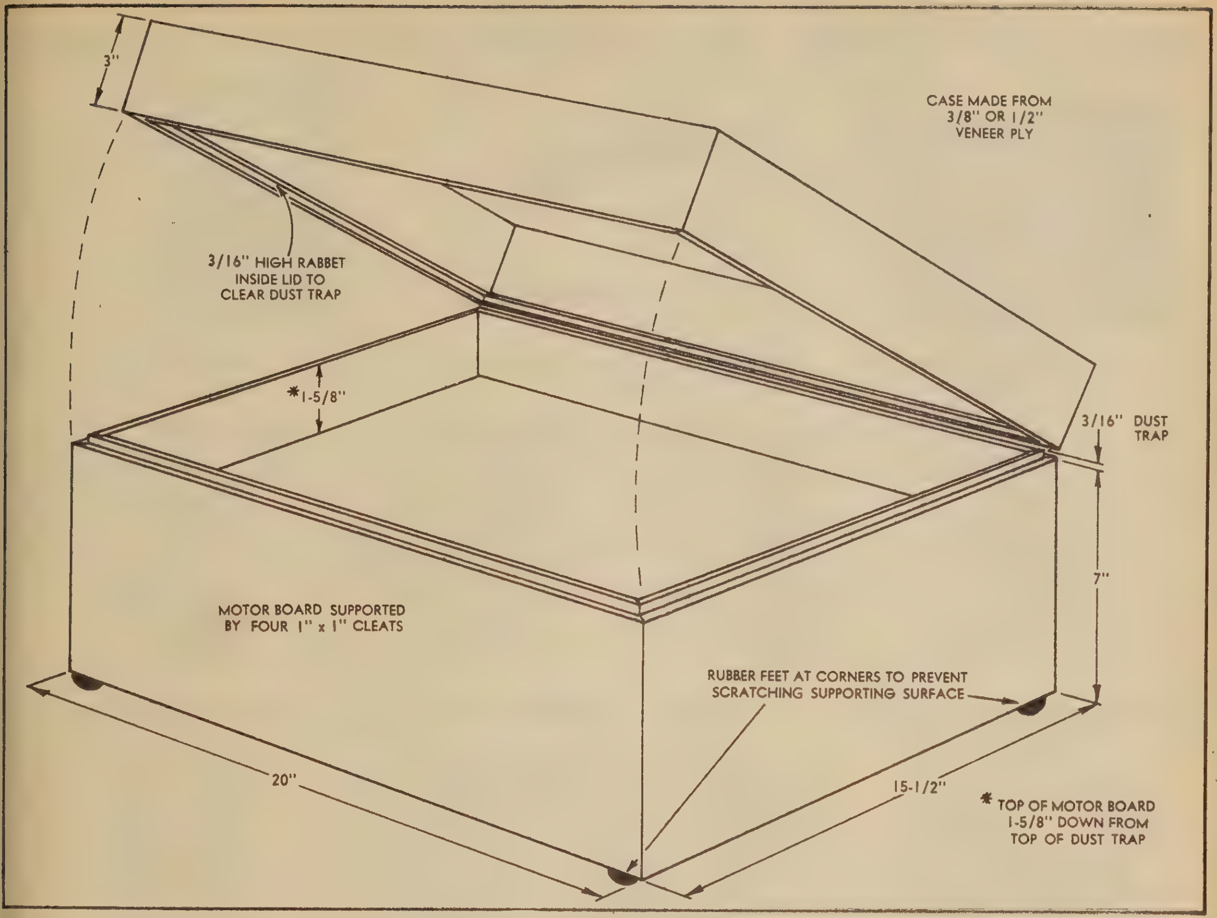
REVOX

HAVE
A LIFETIME'S
EXPERIENCE
IN
TAPE RECORDING

With the use of three motors, the ultimate in simplicity can be achieved. Two motors for winding and rewinding and a third, the Capstan motor, for smooth and even tape transport during recording and replaying. There are no belts — other than that for the counter — no levers and no gears required for engaging the various operating modes.

SOLD AND SERVICED BY AMALGAMATED WIRELESS (AUSTRALASIA) LIMITED

SYDNEY 2 0233. MELBOURNE 67-9161. BRISBANE 4-1631. PERTH 28-3426. LAUNCESTON 2-1804. ADELAIDE 51-0111. WELLINGTON, N.Z. 43-191.


3"
CASE MADE FROM 3/8" OR 1/2" VENEER PLY
3/16" HIGH RABBET INSIDE LID TO CLEAR DUST TRAP
*1-5/8"
3/16" DUST TRAP
7"
MOTOR BOARD SUPPORTED BY FOUR 1" x 1" CLEATS
RUBBER FEET AT CORNERS TO PREVENT SCRATCHING SUPPORTING SURFACE
20"
15-1/2"
* TOP OF MOTOR BOARD 1-5/8" DOWN FROM TOP OF DUST TRAP

A dimensioned sketch of the compact cabinet design discussed in the text and pictured on page 99.

may not be particularly necessary, as a reduction of 0.5 cubic feet or less may not produce any discernable change in performance. This will probably be true in the case of sealed enclosures of 6 cubic feet or more fitted with acoustic resistance material, and to a lesser extent in the case of reflex enclosures and folded horns.

However, with smaller enclosures it would be advisable to increase the dimensions of the enclosure to allow for the equipment volume. Thus it would not be possible to use our original "Bookshelf" enclosure (December, 1964) unchanged, or the larger enclosures (September, 1965) for the nominal speaker sizes originally specified; in general, it will be necessary to use the "next size up." For six-inch speakers, use the dimensions given for 8in types, and so on. The dimensions of an enclosure of this type for 15in speakers would be arranged to give about 4 cubic feet internal volume.

The second point which should be considered is that of heat dissipation. Simply placing the amplifier within the cabinet will not be feasible except with the largest enclosures and reflex enclosures with an unobstructed port, as otherwise the equipment and speaker(s) will be overheated with prolonged operation.

One solution here is that suggested for the player cabinet: placing the power transistors and their finned blocks outside the enclosure. If the enclosure has a reasonably large internal volume the remainder of the unit will not be subjected to undue temperature rise except after a lengthy period of operation on summer days; this may be quite acceptable.

Remember that, for sealed enclosures, the heatsinks will have to be installed in such a way that the cabinet remains strictly airtight.

But perhaps a better solution is to design the enclosure so that the amplifier/power supply is outside the active volume, in an open-backed second compartment. This should involve fewer problems regarding both heat dissipation and enclosure design modification.

If the foregoing sounds rather too general and unhelpful, the author regrets that this should be the case. However, in view of the number of variables involved—not the least is personal preference—it is believed that this sort of general advice is all that can be given. Each constructor will have to decide upon his own approach considering the points which have been mentioned.

Finally, a few words about the compact equipment cabinet design shown in the diagram and photograph. We have arranged with R.C.S. Radio (651 Forest Road, Bexley, N.S.W.) that the latter firm will make available to readers cabinets made to this design at a price which should be quite attractive. The prototype case shown was in fact supplied by R.C.S., so that we could check the practicability and versatility of the design. It is given the popular oiled teak finish, and unless otherwise specified the cabinets will normally be supplied with this finish.

In due course other manufacturers may make cabinets available to this design if it proves to be sufficiently popular. We think it may well become so because, when fitted with a high-quality turntable and pickup, our Control Unit 112 and a suitable power amplifier, and used with a pair of "Bookshelf" enclosures, it forms quite an attractive yet compact stereo system.

For flat-dwellers and home unit owners it might be the ideal choice! ▬

G. E. (U.S.A.) SEMICONDUCTORS

For projects featured by 'Electronics Australia'

DIAC-ST2	$1.30
TRIAC-SC40D	$7.40
UJT-2N2160	$1.90
UJT-2N2646	$1.35
SCR-C20D	$3.80

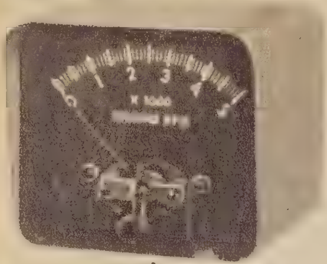
NEW REDUCED PRICES

All plus 12½ p.c. Sales Tax.

AVAILABLE THROUGH RADIO SUPPLY STORES IN ALL STATES.

WATKIN WYNNE PTY. LIMITED
32 Falcon St., Crow's Nest
(P.O. Box 318). Phones: 43-2107, 43-1912

ELECTRONIC DEVELOPMENTS PTY. LTD.



6V & 12V TACHOMETER
$19.25

BM3 CRYSTAL MIC. (Stand extra)
$5.00

TOP QUALITY M/METER
$9.25

WE STOCK METALWORK AND PANELS FOR ELECTRONICS AUSTRALIA PROJECTS AND NUMEROUS OTHER TYPES

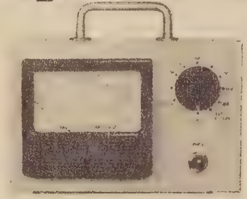
ALUM. & STEEL CHASSIS
ALUM. PANELS
AMPLIFIERS
PREAMPS
SPEAKERS
MICROPHONES
TAPE DECKS

RECORDING TAPE
VALVES
TRANSISTORS
PICTURE TUBES
TRANSFORMERS
CHOKES
TV AERIALS

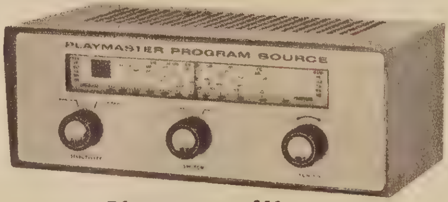
TV COMPONENTS
CONDENSERS
RESISTORS
RECORD PLAYERS
RECORD CHANGERS
TRANSCRIPTION UNITS
METERS

TEST EQUIPMENT
PICKUPS
CARTRIDGES
STYLI
VIBRATORS
PRINTED CIRCUITS
COILS

Popular Kits — Top Quality — Low Price

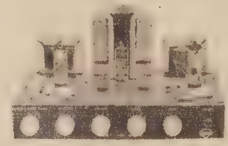


Transistor m/v Meter



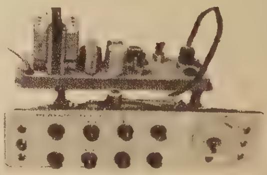
Playmaster III

Impedance Meter



Mullard Stereo 3-3

103 Guitar Amp.



Playmaster 110 Tape Amp.

"GOLDEN SERIES"
20 WATT GUITAR AMPLIFIER
(with Vibrato)

MULLARD 3-3 STEREO AMPLIFIER

MULLARD 10-10 STEREO AMPLIFIER

50 & 144 MC CONVERTER KITS

PLAYMASTER 108 STEREOGRAM

PHILIPS MINIWATT TWIN 10
HIGH QUALITY STEREO AMP.

PLAYMASTER 103
GUITAR AMPLIFIER WITH REVERB AND VIBRATO
Write for particulars

HI-F1 3 MONAURAL AMPLIFIER

ELECTRONIC DEVELOPMENTS PTY. LTD.

Phones 63-3596
63-5973

232 FLINDERS LANE
MELBOURNE . . . . VICTORIA

Phones 63-3596
63-5973

ELECTRONIC DEVELOPMENTS PTY. LTD.

KITSETS - - BUILD IT YOURSELF SAVE £££s

AMPLIFIERS
GUITAR
1 Golden Series, 12 Watt.
2 Std. Series, 20 Watt.
3 Std. Series, 10 Watt.
4 Std. Series, 25 Watt.
5 Std. Series, 35 Watt.
6 Std. Series, 50 Watt.
7 Playmaster 102.
8 Playmaster 103.
HI-FI MONAURAL
9 H-Fi 3
10 Mullard 3-3
11 Mullard 5-10
12 Mullard 5-20
HI-FI STEREO
13 Basic 2
14 Mullard 2-2
15 Mullard 3-3
16 Mullard 10-10
17 Philips Twin 10
18 Playmaster Twin 10
19 Playmaster Twin 17
20 Playmaster Unit 1
21 Playmaster Unit 2
22 Playmaster Unit 3
23 Playmaster Unit 4
24 Playmaster 101
25 Playmaster 105
26 Transistor 1W
27 Transistor 2W
28 Transistor 5W
29 Transistor 10W
P/A UNITS
30 Standard 10W
31 Standard 25W
32 Standard 35W
33 Standard 50W
34 Standard 100W
35 Transistor 10W
36 Transistor 30W
TAPE UNITS
37 Mono No. 3
38 Mono No. 4
39 Stereo
40 Steereo Adapter.
41 Stereo Phone Amp.
PREAMPLIFIERS
42 Transistor Mono
43 Transistor Stereo
CONTROL UNITS
44 Playmaster No. 8
45 Playmaster No. 9
46 Playmaster No. 10
47 Playmaster No. 104
48 4-Channel Mixer
49 Philips Magnetic 3V
50 Mullard 2V
51 Mullard 3V
52 Transistor Mono
53 Transistor Stereo
CONVERTERS
54 S/W Batt. 1
55 S/W Batt. 2
56 S/W A.C. 1
57 S/W A.C. 2
58 All Wave A.C. 2
59 Transistor
60 50 MC/S
61 144 MC/S
62 50-144 MC/S X'Tal Locked
63 D.C.-D.C. 40W
64 D.C.-D.C. 60W
65 D.C.-A.C. 40W
INSTRUMENTS
66 3in C.R.O.
67 5in Wide Range C.R.O.
68 Wide Band C.R.O. Preamplifier
69 R/C Bridge
70 V.T.V.M. (1966)
71 Electronic Stethoscope
72 Sweep Generator
73 Sweep Marker Generator
74 Pattern Generator
75 Diode Noise Generator
76 G.D.O. Adapter
77 Standard Audio Oscillator
78 1962 Wide Range Audio Oscillator
79 Transistor Wave Meter
80 Transistor Signal Tracer
81 Transistor Pattern Generator
82 Transistor Audio, OSC.
83 Valve and Transistor Tester
84 Millivoltmeter
85 Distortion, Noise and Millivoltmeter
86 Mullard Tachometer
87 "R" Decade Box
88 "C" Decade Box
89 Electronic C.R.C. Switch
90 Geiger Counter
RECEIVERS
91 DXERS (Batt.) 1
92 DXERS (Batt.) 2
93 DXERS A.C. 2
94 DXERS A.C. 3
95 DXERS 3 Band 3
96 Little General 1961
97 Interstate 5
98 1962 Stereogram
99 Fremodyne 4
100 Amateur RX
101 Transistor 1
102 Transistor 2
103 Transistor 3
104 Transistor 4
105 Transistor 5
106 Transistor (R.F.) 7
107 Transistor 8
108 Transistor 3 Band 8
TRANSMITTERS
109 V.F.O. 1962
110 Remote V.F.O. 1963
111 144 MC/S A.M. TX
112 144 MC/S S.S.B. TX
113 1962 S.S.B. TX
114 144 MC/S Linear Final
MISCELLANEOUS
115 Light Beam Relay
116 Flasher Unit
117 Regulated 9V D.C. Supply
118 Universal Battery Charger
119 Intercomm. Unit
120 Metronome Unit
121 TV Hearing Aid
122 Porta Player

If you cannot see your project listed—write for a quote, we have many other units available or in development.

METERS —— METERS —— METERS

All types . . . all sizes . . . all ratings . . . BUT with a single common factor — TOP QUALITY AND LOW COST
CHECK THE VALUE FOR BARGAIN BUYING — (all meters meet BSI standard)

Meter Size	Movement	*Price
1⅝" x 1⅞"	50 Microampere	$5.25
" "	100 Microampere	$4.45
" "	500 Microampere	$3.40
" "	50-0-50 Microampere	$4.25
" "	100-0-100 Milliampere	$3.95
" "	0-1 Milliampere to	$3.25
" "	V.U. Meter	$5.25
" "	"S" Meter	$4.75
3½" 3"	50 Microampere	$8.60
" "	100 Microampere	$7.00
" "	500 Microampere	$5.50
" "	50-0-50 Microampere	$7.00
" "	100-0-100 Microampere	$6.20
" "	0-1 Milliampere to 0-500	$4.75
3½" x 3"	V.U. Meter	$8.25

Meter Size	Movement	*Price
4⅝" x 4⅛"	50 Microamperer	$9.60
" "	100 Microampere	$7.85
" "	500 Microampere	$6.20
" "	50-0-50 Microampere	$7.85
" "	100-0-100 Microampere	$7.00
" "	0-1 Milliampere	$5.75
" "	V.U. Meter	$9.85
	Horizontal Reading Meters	
Scale 3¼" x 1"		
	0-50 Microampere	$9.85
	0-100 Microampere	$8.95
	0-500 Microampere	$8.30
	0-1 Milliampere to 0-500 Milliampere	$7.50
	Stereo Balance	$7.75

*PLUS 12% S/TAX

Many other types including ammeters, voltmeters, battery and tune meters, round, square, rectangular and horizontal readings. Write for further particulars.

Loudspeakers **FANE** *Reproducers*
High Fidelity *High Wattage*

UNSURPASSED FOR POWER HANDLING — FROM 20 TO 60 WATTS — R.M.S. LEAD—RHYTHM AND BASS GUITAR TYPES
Also Electronic Organ Units High Fidelity Types—Freq. Response 30CPS-15Kcs — Write for Specifications and Prices.

ELECTRONIC DEVELOPMENTS PTY. LTD.

Phones 63-3596
63-5973

232 FLINDERS LANE
MELBOURNE . . . . VICTORIA

Phones 63-3596
63-5973

Classical reviews

By JULIAN RUSSELL

A Mendelssohn Revival

ANSERMET Conducts Mendelssohn Symphony No. 4 in A Major, Op. 90 ("Italian"). Overtures to "The Hebrides" Op. 26; "Ruy Blas" Op. 95; and "The Fair Melusina" Op. 32. Ernest Ansermet and the Swiss Romande Orchestra. Decca Stereo SXL6166.

Interest in Mendelssohn's music seems to be reviving after a lapse of some 40 years. True some of his works remained in concert repertoires during this period —the Violin Concerto — Hebrides Overture in particular, while the Midsummer Night's Dream music continued to be played by cafe trios. But by and large his music was scorned by musicians of the 20s as altogether too neat and genteel.

A sign of the times is this disc from Decca which offers, in addition to the "Italian" Symphony which never quite lost its popularity, the "Ruy Blas" overture which can't have been heard very often since its use as "conflict" music in silent films, "The Hebrides," and the overture "The Fair Melusina" which I heard here for the first time.

The full title of the last is "The Fairy Tale of the Beautiful Melusina." It is really more of a tone poem than an overture and has never been popular. But it is for the most part a gentle work, full of feminine charm, admirably played, and well worth the space allotted it on this pleasing disc.

In "The Hebrides," which might be better known to some music lovers under its alternative title of "Fingal's Cave," Ansermet early evokes a picture of broad Atlantic waves swelling and receding. But a comparison with Szell's performance put out last year shows that where Szell keeps the tempo steady, a characteristic of Atlantic combers, Ansermet drags his a little so that every now and again he has to speed up unnaturally in the stormier bits. After all, oceans just don't behave like this. But otherwise the performance is fine.

"Ruy Blas" gets an exemplary performance, splendidly disciplined yet sensitive. But the "big" piece is, of course, the "Italian," which faces notable competition, particularly from the Solti Israel Philharmonic disc reviewed here recently and which has the advantage of a lower price. Under Ansermet the charming symphony retains its sunshine but misses a little of southern bustle. It is a first rate reading but slightly more sober than Solti's.

The playing is faultlessly precise, the phrasing natural, and the sound good. If you have so far neglected to add a good cross section of Mendelssohn's orchestral music to your library here is a good buy.

BRITTEN—Variations on a Theme by Frank Bridge.

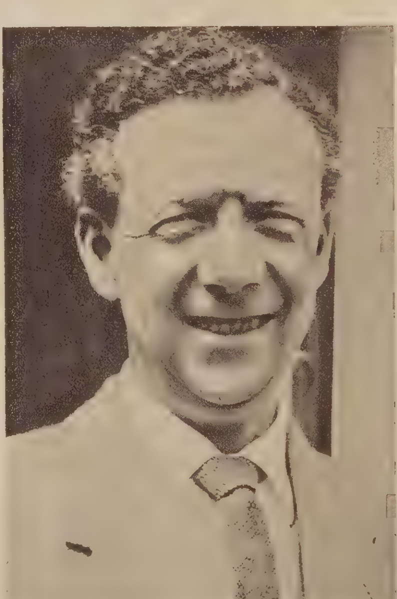
TIPPETT—Fantasia Concertante on a Theme of Corelli.

CORELLI—Concerto Grosso in F, Op. 6 No. 2. Yehudi Menuhin and the Bath Festival Orchestra. Tippett Fantasia conducted by the composer. HMV Stereo OASD637.

Here is a splendid record that has something for every taste in its program and must impress everyone with the distinction of performance received by all three pieces. The Britten was, I think, the first work to gain general recognition for the then young composer. Boyd Neel commissioned it for his orchestra to play at the 1937 Salzburg Festival. It had a great vogue for a few years but has lately appeared only seldom on concert programs and records.

Its revival here is welcome for two reasons. It is consistently melodious, technically it displays enormous resources in variation form, and, as you hear it played here, it must surely offer one of the finest performances for string orchestra ever issued. Menuhin and his orchestra play the 30-year-old work with wit, passion, incomparable accuracy of ensemble, and beauty of tone.

The Corelli Concerto Grosso is included in the recital since it includes the theme used by Tippett in his Fantasia Concertante. It is an uneven work, smallish in form with stretches of beautiful music to be enjoyed as a respite from some that is only routine eighteenth century stuff. To reinforce the already impressive string section of the orchestra, Menuhin engaged two fine soloists Robert Masters on the violin and Derek Simpson on the cello. These two, by the way, stay in the band for the Tippett too.



BENJAMIN BRITTEN

This latter was also commissioned for first performance at a festival, the 1953 Edinburgh Festival. It is typical of Tippett at that period, diatonic, logica in form, and unmistakeably English in accent and vocabulary. Its dialectic can be easily assimilated at first hearing by anyone used to hearing music composed during the past 30 or 40 years.

It structure is simple—a set of variations, skilfully put together, makes up the first part. A fugue comes next followed by an Andante/Adagio apotheosis If it is occasionally a little garrulous that feature is in keeping with the style of the eighteenth century violinist composers to whom Corelli belonged. The scoring however, is another matter. I find it difficult to understand why a composer who can use beautifully stranded polyphony should now and again thicken his textures to the exten Tippett so frequently does.

And it is only after several repetitions that I got used to the idea, so suddenly does it finish, that some of the last bars had not been omitted. It should, however, appeal to all string players who if they are honest, will marvel with me at the polish with which it is presented on this attractive disc.

* * *

MOZART—Symphony No. 38 in D Major (K.504) "Prague"; Symphony No. 32 in G. Major (K.318). London Philharmonic Orchestra conducted by Peter Maag. Ace of Diamonds Stereo SDDA122.

I consider this an excellent buy at $3.65 (36/6). There is nothing to suggest that it has been put out at an economy price. It was originally issued some six or seven years ago at the normal price and is re-issued now when it must face again competition from fully-priced discs, though none of those known to me couple the "Prague" with the tiny G Major as a fill.

The playing of the London Symphony Orchestra throughout is sensitive in technique and in response to the conductor's many demands in the matter of phrasing and nuance. And it is in nuance that Maag excels, raising and reducing his dynamic level so that one never tires of a constantly even tone. He does however, avoid any hint that this is a highly personalised reading which distorts the composer's intentions. If some of his nuances are not marked in the score they are always logical and never lapse into questionable taste.

The dynamic range is perhaps a shade wide for this eighteenth century music but otherwise I feel disinclined to offer further criticism of so satisfactory a performance.

The G Major is very brief indeed Its three movements, played without pause, run 20 seconds under 10 minutes It could be described as a symphonic overture rather than a symphony, or perhaps sinfonietta might be still better At any rate it makes very easy listening and, a slightly too heavy accent here and there excepted, receives the same expert treatment as its bigger consort

BRUCKNER—Symphony No. 6 in A Major. New Philharmonia Orchestra conducted by Otto Klemperer. Columbia Stereo SAX2582.

It is nowadays trite to describe Bruckner's symphonies as architectural, though it is difficult to find a better word to describe spaciousness. In terms of architecture they always remind me of cathedrals, lofty, solid, and generally unalterably conservative in their function if not always in their design.

Not unexpectedly, Klemperer offers here a spacious conception of the symphony, and is rewarded by superb playing from the New Philharmonia. (This orchestra changed its name by adding "New" after severing its relations with its founder, Walter Legge.) The tone is rich, the first desk men impeccable in style and technique, and Columbia has provided a suitably noble acoustic to accompany the slow unfolding of the work.

The music itself owes much to some of Bruckner's more illustrious predecessors, especially Wagner, for whom he had a reverence that was never reciprocated. Wagner, in fact, thought him something of a bore both personally and musically. But there are also passages of real originality which sound all the more refreshing coming as they do in the midst of so much diatonic musing.

But grand as Klemperer's reading is in conception and execution, what I did miss was any sense of an exalted spiritual communication. There is no mystery. Everything is made just a trifle too clear. But that might be a purely subjective reaction, for try as I might, I could not put my finger on any one spot where Klemperer went wrong. Technically, there is only one slight imperfection in the production — an awkward, and I should have thought easily avoidable, turnover in the middle of the adagio .

* * *

BRUCKNER—Symphony No. 9 in D Minor. (Original Version). Vienna Philharmonic Orchestra conducted by Carl Schuricht. Record Society Stereo S/6168.

This is an odd, and for a conductor of Schuricht's fame, disappointing performance. I heard Schuricht conduct last July at The Hague in Holland. At 84 he had to be helped on to the stage using two elbow-length crutches, but once there, propped up against the rostrum, he gave as fine a performance of Brahms' Second Symphony with the Residenz Orchestra as anyone might hope to hear.

His fault in the first movement of the Bruckner seems to be that in seeking rhythmic interest that just isn't there he accents the last beat of 4/4 bars to such an extent that he sets up a swaying effect quite alien to the music. And it is so consistent that it becomes in time quite irritating.

I found his scherzo, however, entirely enjoyable. Schuricht seems to revel in its perky dissonances and modulations to unrelated keys and points its rhythmic vitality as deftly as might a conductor 50 years his junior. I enjoyed also the way he keeps the adagio moving a little faster than most other conductors sacrificing nothing of the movement's dignity to welcome brevity.

At The Hague he saw to it that the strings gave him smooth tone in every department. But here, using perhaps the finest string section in the world, he succeeds only in obtaining a quite foreign roughness of tone that must have surprised any members of the Vienna Philharmonic who listened to a playback of their performance.

* * *

ROSSINI—Stabat Mater. New York Philharmonic Orchestra with Martina Arroyo (soprano), Beverly Wolff (mezzo-soprano), Tito del Bianco (tenor), Justino Diaz (bass) and The Camerata Singers, conducted by Thomas Schippers. CBS Stereo SBR235134.

Rossini's Stabat Mater has, since its first performance, been criticised as being too operatic in style for a sacred work. The same charge has, of course, been made against the Verdi Requiem. But both works have survived triumphantly. Thomas Schippers never underplays the dramatic exhuberance of Rossini's score but is careful to keep everything well within the bounds of good taste.

He has a good orchestra and a well-drilled choir always combined to achieve the maximum effect of efficient performance. But in the way of soloists he is not so well served. The mezzo-soprano, Beverly Wolff, has a wide range smooth in every register and unfailingly pleasing in quality. The bass, Justino Diaz, is also impeccable in style and tone and provides a richly solid foundation for the other members of the solo quartet to build on.

Most disappointing among these is the tenor, Tito del Bianco, who sees every phrase is delivered in a pain-laden voice reminiscent of a poor man's Gigli at his most tearful. It is a style that never fails to irritate me whatever the singer's other merits, which in this case are few indeed. His singing is consistently coarse grained and he strains much more than is permissible to reach top notes.

Except for an occasional passage, soprano Martina Arroya, despite conscientious application and plenty of enthusiasm, has not the technical equipment to deal with Rossini's exacting writing, which demands the very highest standard of vocal polish. The first-rate sound might, however, make the set worthwhile even with the blemishes noticed above.

* * *

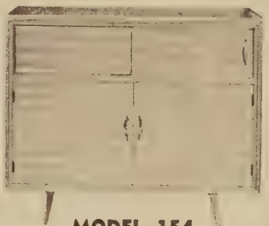
FRANCK — Chorales Nos. 1, 2 and 3. Pastorale. Played by Fernando Germani on the Organ at Selby Abbey, Yorkshire. HMV Stereo CSD-1474.

Franck is another composer whose music has been neglected during the last 30 or 40 years, the only works of his remaining regularly in the concert repertoire being the Symphonic Variations for Piano and Orchestra and the D Minor Symphony. Organists, however, have continued to remain loyal to this highly respected member of their fraternity and can, I think, be relied on to support this beautifully played recital.

Their first interest will probably be in the organ used. In addition to a complete list of all its stops they will find in the

STEREO EQUIPMENT CABINETS

New 1966 models are now available. Can be supplied in "make it yourself" kits.



MODEL 154

With lift-up lid over player. Sliding door in front of amplifier compartment. Large storage space. Size: 36in wide, 17½in deep, 31in high.

Price:	
Made and polished	$53.00
Packing	$ 2.20
Kit of parts	$33.50
Packing	$ 1.40
Teak	Extra $ 7.00

Free on rail.

Write for Catalogue

H. B. RADIO SALES

Manufacturers of Quality Radio and Radio Furniture for 36 years

103-105 Catherine Street,
LEICHHARDT, SYDNEY.
Telephone: 56-5580

HAUFE HIGH QUALITY

Wide frequency response microphone transformers for recording, television broadcasting.

MADE IN GERMANY

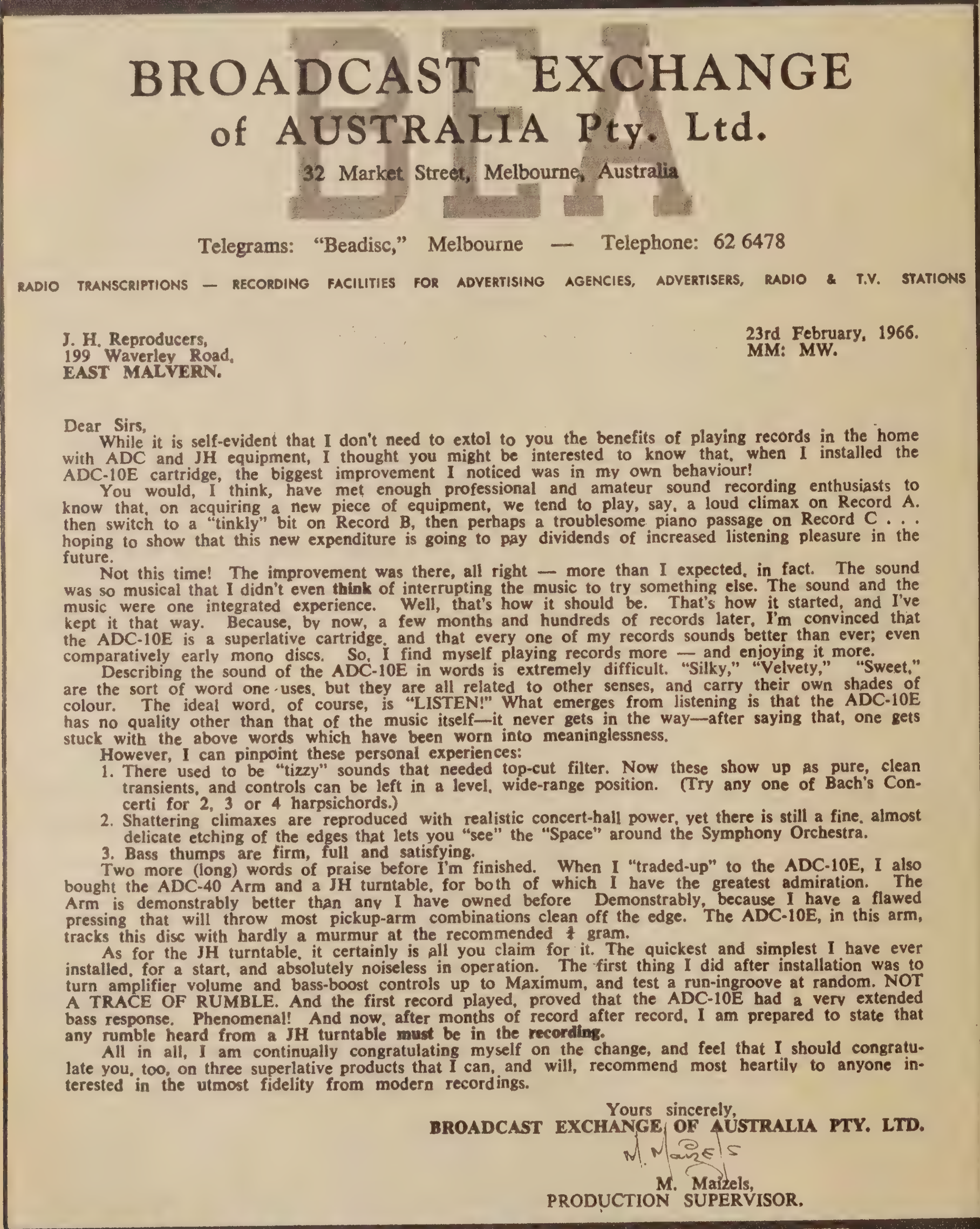
TYPE T119/1A. Mu-Metal cored and single-screened one hole mtg. microphone transformer: split primary 50 or 200 ohm, ratio 1:20 ± 1.5db 20-20Kc. PRICE. $5.22

TYPE T30/30. Mu-Metal cored and triple screened one-hole mtg. microphone transformer: split primary 50 or 200 ohm, ratio 1:20 or 1:30, frequency response ±1db 20-20Kc. PRICE $11.15

TYPE 132/1. Similar to Type T119 but unscreened and designed for microphone inputs to transistor amplifiers. Primary impedence 50 or 200 ohms, secondary impedence 1250 ohms. PRICE $2.24

WILLIAM WILLIS & Co. Pty. Ltd.
428 ELIZABETH ST., MELBOURNE, C.1
Phone 34-6539

This is the letter from Mr M. Maizels well-known creative sound engineer at Melbourne's leading recording studios.



BROADCAST EXCHANGE of AUSTRALIA Pty. Ltd.

32 Market Street, Melbourne, Australia

Telegrams: "Beadisc," Melbourne — Telephone: 62 6478

RADIO TRANSCRIPTIONS — RECORDING FACILITIES FOR ADVERTISING AGENCIES, ADVERTISERS, RADIO & T.V. STATIONS

23rd February, 1966.
MM: MW.

J. H. Reproducers,
199 Waverley Road,
EAST MALVERN.

Dear Sirs,

While it is self-evident that I don't need to extol to you the benefits of playing records in the home with ADC and JH equipment, I thought you might be interested to know that, when I installed the ADC-10E cartridge, the biggest improvement I noticed was in my own behaviour!

You would, I think, have met enough professional and amateur sound recording enthusiasts to know that, on acquiring a new piece of equipment, we tend to play, say, a loud climax on Record A. then switch to a "tinkly" bit on Record B, then perhaps a troublesome piano passage on Record C . . . hoping to show that this new expenditure is going to pay dividends of increased listening pleasure in the future.

Not this time! The improvement was there, all right — more than I expected, in fact. The sound was so musical that I didn't even **think** of interrupting the music to try something else. The sound and the music were one integrated experience. Well, that's how it should be. That's how it started, and I've kept it that way. Because, by now, a few months and hundreds of records later, I'm convinced that the ADC-10E is a superlative cartridge, and that every one of my records sounds better than ever; even comparatively early mono discs. So, I find myself playing records more — and enjoying it more.

Describing the sound of the ADC-10E in words is extremely difficult. "Silky," "Velvety," "Sweet," are the sort of word one uses, but they are all related to other senses, and carry their own shades of colour. The ideal word, of course, is "LISTEN!" What emerges from listening is that the ADC-10E has no quality other than that of the music itself—it never gets in the way—after saying that, one gets stuck with the above words which have been worn into meaninglessness.

However, I can pinpoint these personal experiences:

1. There used to be "tizzy" sounds that needed top-cut filter. Now these show up as pure, clean transients, and controls can be left in a level, wide-range position. (Try any one of Bach's Concerti for 2, 3 or 4 harpsichords.)
2. Shattering climaxes are reproduced with realistic concert-hall power, yet there is still a fine, almost delicate etching of the edges that lets you "see" the "Space" around the Symphony Orchestra.
3. Bass thumps are firm, full and satisfying.

Two more (long) words of praise before I'm finished. When I "traded-up" to the ADC-10E, I also bought the ADC-40 Arm and a JH turntable, for both of which I have the greatest admiration. The Arm is demonstrably better than any I have owned before Demonstrably, because I have a flawed pressing that will throw most pickup-arm combinations clean off the edge. The ADC-10E, in this arm, tracks this disc with hardly a murmur at the recommended ¾ gram.

As for the JH turntable, it certainly is all you claim for it. The quickest and simplest I have ever installed, for a start, and absolutely noiseless in operation. The first thing I did after installation was to turn amplifier volume and bass-boost controls up to Maximum, and test a run-ingroove at random. NOT A TRACE OF RUMBLE. And the first record played, proved that the ADC-10E had a very extended bass response. Phenomenal! And now, after months of record after record, I am prepared to state that any rumble heard from a JH turntable **must be in the recording.**

All in all, I am continually congratulating myself on the change, and feel that I should congratulate you, too, on three superlative products that I can, and will, recommend most heartily to anyone interested in the utmost fidelity from modern recordings.

Yours sincerely,
BROADCAST EXCHANGE OF AUSTRALIA PTY. LTD.
M. Maizels
M. Maizels,
PRODUCTION SUPERVISOR.

J. H. REPRODUCERS PTY. LTD.

199 WAVERLEY ROAD, EAST MALVERN, VICTORIA
Telephone 211-5149
Exclusive Australian Representative for ADC, USA and Makers of the J.H. Turntable and P.U. Arm.

sleeve notes the following interesting facts.

"Rebuilt in 1948-50 by William Hill and Son and Norman and Beard this magnificent instrument incorporated much of the original Hill organ of 1909. It is divided into three — the two cases facing each other across the chancel contain, on the south side, the Great and part of the Pedal, and on the north side, the Choir, Swell and Solo and part of the Pedal. The largest pipes of the 32ft Double Open Diapason are situated high up in the nave triforium on the north side. The console, originally contained in the north case, is now detached and stands by the altar rail. Its place has been taken by the Choir organ which is now enclosed. The specification was drawn up by Walter Hartley who has been organist and master of the choristers since 1922."

I happen to have heard it a few years ago and admired its unusual clarity which enables the listener to appreciate details that can be obscured by the sharper-toned reeds on Franck's own organ at St. Clothilde in Paris, which, by the way, was also undergoing a facelift during my visit there in 1962. The Selby organ is a big romantic instrument with all the nineteenth century additions. Those who buy this record expecting to hear the dainty sound produced by a baroque organ will be disappointed. It will appeal more to those who admire the organ in the Sydney Town Hall.

Germani's playing refreshes these sometimes slightly faded pieces. His reverence is patent, his sympathy for the music fraternal. His judgment on phrasing and registration is never at fault and the stereo engineering excellent.

★ ★ ★

VIVALDI—The Four Seasons. Members of the New York Philharmonic Orchestra conducted by Leonard Berstein. CBS Stereo SBR235133.

Here is some more music by an eighteenth century violinist/composer. The works played here are taken from a larger work given the fanciful title of "The Trial of Harmony and Invention" by the composer. This has been variously construed as meaning the rivalry between technique and invention or the conflict of music and fancy. The pieces on this disc are the first four and are called "The Four Seasons" because of a program descriptive of Spring, Summer, Autumn and Winter, each prefaced by an appropriate sonnet, the Italian and English texts of which are supplied on the record sleeve.

At various points in the score Vivaldi added other more detailed program notes such as "Song of the Birds," "The Baying Dog," "Languor from the Heat," "Horrid Wind," "Running and Stamping One's Feet from the Cold" and other picturesque concepts. The listener should have no difficulty in attaching them to where they belong in the score.

The playing of Bernstein and the New York Philharmonic suffers badly from comparison with that of Menuhin and the Bath Festival Orchestra noticed above. For where in the latter everything is gracious and subtle, Bernstein's performance is very heavy-handed. His rhythms are certainly vigorous, but unnecessarily harsh in accent. And though his orchestra plays with commendable precision there is little of affection or warmth to be heard. Everything is cold, even clinical.

Yehudi Menuhin, one of whose recordings is reviewed on page 104, recently conducted a series of lessons for young violinists on B.B.C. television. Here he is with two young beginners, both eight years old.

There are some eminently enjoyable passages, usually the calmer ones, and Bernstein is, of course, always happy of the chance to dramatise the many little storms and squalls that blow up from time to time. He himself conducts and plays the harpsichord continuo simultaneously—a big-toned, rather jangling instrument eminently suited to the coarse-grained playing of his orchestra. While one is, most of the time, forced to admire the virtuosity of his players, I found it impossible to enjoy much else.

★ ★ ★

LISZT—Totentanz. Piano Concerto No. 1 in E Flat Major. Hungarian Fantasia. Georgy Cziffra and the Philharmonia Orchestra conducted by Andre Vandernoot. HMV Stereo OASD629.

Here is a record to make anyone marvel at, and pianists envy, the apparently limitless technical resources of the soloist. He takes some passages at speeds many might think impossible until they hear them. Yet there is never a stumble, nor even a blur. Each note, however close it might be on the heels of its predecessor, remains beautifully and cleanly separated. Cziffra has always deployed an astonishing fluency, but in these performances he rivals even the best of his earlier achievements.

I am safe in writing that his playing of his opening tune, the Totentanz, cannot be matched by any other pianist playing today. It is a dazzling display of sheer virtuosity, marred, alas, to a slight extent by an acoustic that makes his piano sound shallow in the bass and dry in the treble. On reflection, this might have been sought by HMV's engineers to provide as clear a sound as possible so that no single bar, however quickly it might flash by, is blurred.

If that is so the idea was not good, because the orchestra also suffers from lack of tonal eloquence, and produces not at all the sort of sound one has come to expect from the Philharmonia. Personally I would have been happier with a more mellifluous and less brittle sound.

Cziffra is no less accomplished technically in the E Flat Piano Concerto but here, where interpretation counts for more, there are alternative versions. I prefer, notably, Julius Katchen's which can now be bought on the Ace of Diamonds low-priced label. Katchen's is an infinitely more poetic performance, and he is no slouch as a technician either.

The recital finishes with the Hungarian Fantasia, an old warhorse of a piece in which Cziffra reveals nothing new except a few gratuitous flourishes of his own, but plays with the same staggering velocity he displays all through this program.

Recommended

Gigli — 8 Arias and 8 Songs. A good mixed recital of items originally recorded during the 1920s. RCA Mono LM2826.

Joan Sutherland Sings Handel — Arias from Alcina, Julius Caesar, Samson, and Messiah, accompanied by different orchestras and conductors. Decca Stereo SXLA6191.

Tchaikowsky — Symphony No. 4 in F Major. Boston Symphony Orchestra conducted by Charles Munch. RCA Victrola Stereo VICS1100.

The Sons of Bach. Vol 2. Concertos for keyboard instruments and strings by Carl Philipp Emanuel, Johann Christian, and Wilhelm Friedeman with Robert Veyron-Lacroix (harpsichord and piano), Hughuette Dreyfuss (harpsichord), and the Chamber Orchestra of the Saar Radio conducted by Karl Ristenpart. Record Society Stereo S/6174.

Handel — Organ Concertos Vol. 2. Marie-Claire Alain (organ), Anne-Marie Becksteiner (harpsichord) and the Jean-Francois Paillard Chamber Orchestra conducted by Paillard. Record Society Stereo S/6107.

Tchaikowsky — Piano Concerto No. 1 in B Flat Minor, played by Emil Gilels and the Chicago Symphony Orchestra conducted by Fritz Reiner. RCA Victrola Stereo VICS1039.

Fantasia —The film-track of Disney's famous film re-recorded in stereo. Three records in box with brochure. World Record Club Stereo S/T4026/7/8.

MODEL 643
STEREO RECORD PLAYER

FEATURES

Functions perfectly - "rumble", "wow" and "flutter" completely eliminated.

Special flexible rim-belt drive from truly vibration-free patented motor suspension which isolates all vibration from base plate.

Drive spindle ground and polished to extremely fine tolerances. (0.000,04").

The turntable is provided with nylon and bronze bearings. These are self-lubricating and no lubrication should ever be necessary.

Velvet action arm lifting and lowering device.

Interchangeable pickup heads enable use of monaural and stereo, ceramic or magnetic cartridges.

The pickup arm is provided with adjustment for both stylus pressure and height.

Asynchronous motor (not tied to mains frequency) with special governor making motor independent of mains voltage and frequency.

Outstanding Danish design produced under strict quality control: every turntable individually test run and carefully checked before leaving factory.

TECHNICAL DATA.

Two models are available 643 & 643F. The 643F has a special mounting bracket to hold an SRT pre amplifier and also has windings on its motor to provide power for the pre amplifier.

Supply Voltage:	240 volts, 50 c/s
Pickup:	Merula ceramic or B & O SP1 in plug in heads with standard mounting holes. 2 pole asynchronous motor and centrifugal governor, speed regulation ± 15%. The complete motor and speed change assembly is suspended from the main chassis by 3 horizontal spiral springs, excessive vertical movement being prevented during transport by 3 plastic "buffer bobbins".
Power consumption:	11 watts.
Wow & Flutter:	Less than ± 0.2% peak.
Belt drive:	Ensuring extremely low rumble
Pickup:	Lift/replace device.
Mat:	Moulded rubber 9 inches dia. stroboscopic markings.
Length:	13.2 in. (335 mm)
Width:	10.1 in. (225 mm)
Height above mounting board:	2 in. (50 mm)
Depth below mounting board:	3.3 in. (85 mm)
Weight:	11 lbs (5.0 kg)

MERULA CERAMIC CARTRIDGE

An exceptionally pleasant sounding ceramic on account of its low distortion. Its high compliance minimizes record wear.

Frequency Response:	20 cps - 14,000 cps + 2½dB 40 cps - 12 cps
Output:	65 mV/cm/sec.
Intermodulation:	less than 2% by 8 mv.
Tracking weight:	3 gm
Loading:	2 Megohm

B & O - SP1 CARTRIDGE

Frequency Response:	± 2.5 dB from 30 c/s to 20 kc/s (Equalizing after RIAA Standard).
Output Voltage:	7mV per channel at 5 cm sec. at 1000 c/s.
Channel separation:	20 dB minimum.
DC Resistance:	1250 Ohms
Inductance:	200 mHy
Recommended Tracking Force:	3 grams
Compliance:	5 x 10^{-6} cm/dyne in all directions.
Moving mass:	Less than 3 mg.
Recommended Load:	47,000 ohms or higher.
Weight:	10 grams
Stylus Standard:	Diamond, radius of curvature: 17 /u (7 mil).
Stylus replacement:	See special literature.

Sole Australian Agents:

G.R.D INSTRUMENTS Pty. Ltd.

6 RAILWAY WALK, CAMBERWELL, VICTORIA, 82 1256

A Labcraft
Made in Denmark
TURNTABLE

DOCUMENTARY RECORDS

Reviewed by Ellis Blain

ARCHIBALD MACLEISH READING HIS POETRY. Philips Caedmon TC 1009.

Primarily, Archibald Macleish is a poet of word beauty. Constantly, one is captivated by the subtlety of his choice of words, its exactitude and enchantment.

The first side of this anthology consists, almost entirely, of shorter pieces, fragments of impressionism, some penetrating deeply, others remarkable for sheer beauty. And the voice is the perfect medium for the words; the two seem so inseparable that one wonders whether another reader could do such justice to the meaning.

The second side is taken up entirely with a major work, "Actfive," which was published three years after the end of World War II. It makes no concessions to false enthusiasms. Throughout, there is a mockery of revered myths, yet something must survive, "the nameless flesh and bone," lacking any Godlike identification with the past and containing only the inherent human compulsion to be "Beautiful and Brave."

A splendid representation of an important contemporary voice. Despite the recording of 1952 vintage, sound is quite satisfactory and the album is excellently presented with a particularly well written biographical note.

★ ★ ★

HELLO DERE! Marty Allen and Steve Rossi. ABC Paramount ML 30810.

Hardly documentary, although it is spoken word from start to finish. A comedy team which is described by "Variety" as "One of the top comedy acts extant," I'm afraid I listened to this actuality with only an occasional smile. Most of the gags are tied so closely to the local United States political scene that they don't export.

★ ★ ★

MAKE 'EM LAUGH — On Writing Television Comedy. Delyse DMC 771.

This record is true documentary and is, in essence, a well edited actuality account of a seminar attended by top British television writers who frankly discuss their work from every possible angle. Duncan Wood, Alan Simpson, Hills and Green and, of course, Norden and Muir are fully represented. For anyone actually interested in learning the art of writing television comedy, the record will be invaluable. As entertainment, it varies considerably as, by no means all the writers speak as amusingly as they write. On the other hand, any commercially available record of the unique contributions of Frank Muir and Denis Norden cannot be dismissed. Here, they are more serious than I have ever heard them, but in some intangible way, just as magnetic, as listenable and as fascinating as always. And when they do play for a laugh, it is a rib-buster.

★ ★ ★

J. B. PRIESTLEY READING ESSAYS FROM "DELIGHTS." Argo RG 159.

Who doesn't recognise immediately the inimitable voice of Priestley? The voice almost as much as the literary style itself is both characteristic and evocative of the thirties. Despite his still large and devoted following, it is for nostalgia that we turn to the creator of "The Good Companions." And what more engrossing nostalgia could be found than these miniatures with titles such as "Smoking In A Hot Bath," "Not Going," "Smell Of Tahiti," "Long Trousers" and "Orchestral Conductors."

★ ★ ★

JEEVES BY P. G. WODEHOUSE. Terry Thomas and Roger Livesey. Philips Caedmon TC 1137.

It would be interesting to know the extent to which Wodehouse sells today. I should not be surprised if his following isn't a good deal larger than one would at first expect . . . It takes a minute or two to get into the style and period as one listens to this fascinating presentation, but the absolutely top class acting and direction soon overcome all resistance and the chuckles and delights cannot be suppressed.

Each side of the disc contains a complete story appropriately edited. They are "Indian Summer Of An Uncle" and "Jeeves Takes Charge." Wodehouse himself describes the origin of Jeeves. "As a child I lived on the fringe of the butler belt. As a young man I was a prominent pest at houses where butlers were maintained. And later I employed butlers, though I cannot point it out too strongly that Jeeves is not a butler, he is a "gentleman's personal gentleman."

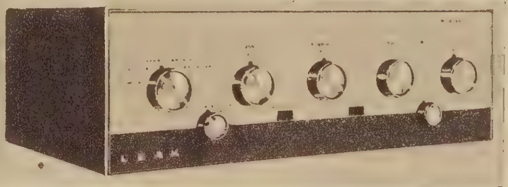
ACOS CHANGER DUST BUG

PRICE £2/15/-

Essential to all who value their records, the Changer Dust Bug clips easily over most changer arms and sweeps the record both before and behind the stylus, at the same time depositing a very fine antistatic film which prevents dust attraction through static changes. Record and styli life can be increased by up to five times with a Changer Dust Bug. Spare fluid, bristles and plush pad are available in complete spares kit.

AMPLION (A/SIA) Pty. Ltd.,
29 Major's Bay Rd., Concord, N.S.W.
Vic. Distributors: E. W. Cornelius Pty. Ltd.,
5 Northumberland St., Sth. Melbourne, Vic.

STEREO EQUIPMENT



FULL TECHNICAL SERVICE AVAILABLE

Extensive range brand names available from
$100 to $2000

ALL TYPES OF EQUIPMENT AVAILABLE

Write or phone for prices or arrange demonstration any hour

WHOLESALE AND RETAIL
Trade enquiries welcomed
TELEPHONE: 20-4169

CLOW SOUND SYSTEM
1340 MALVERN ROAD, MALVERN, VICTORIA.

OPPORTUNITY KNOCKS!

Don't be fooled. There are no short cuts to an honest, profitable, dependable business. Build a substantial business or spare time enterprise you can depend upon. Full free details of a wide variety of money-making plans, sent without obligation. Any one could mean lots of extra money and independence. If serious minded, send stamp for postage NOW. If not, forget it.
Dept. RH30, Box 5070, G.P.O., SYDNEY.

HI-FI STEREO EQUIPMENT BY CLASSIC

Based on Radio & Hobbies Playmaster No. 4 and Playmaster 101 Amplifiers. Both units have built in dual wave tuners.

WRITE FOR FULL SPECIFICATIONS

Stereomaster by Classic

ALL UNITS FULLY GUARANTEED

SPECIFICATIONS COMMON TO BOTH UNITS:

● Inbuilt high gain dual wave tuner with a frequency coverage of 550 to 1,600 K.C. on the broadcast band and 16 to 49 metres on short wave. ● EM84 tuning indicator giving accurate tuning with ease. Two channel tone control stage with separate bass and treble controls. ● Input facilities with switching for external tuner—stereo pick-up—stereo or mono tape recorder for recording or play back. ● Stereo reverse switch. ● Calibrated dial scales available for all States showing main stations in large type with separate scale for short wave using two dial pointers. ● Chassis is mounted in attractive and durable metal case finished in grey with embossed control panel in black and silver with matching knobs.

PLAYMASTER 4 UNIT WITH TUNER

- **Output 8 watts per channel (16) watts.**
- **Incorporating Ferguson grain oriented output transformers giving response of 20 to 30,000 cycles.**
- **Valves, 4 6GW8, 12AU7, 6N8, 6AN7, EM84, and two IN1763 rectifiers.**

AMPLIFIER AND TUNER $105.50, WITH GARRARD AUTOSLIM STEREO CHANGER AND TWO MAGNAVOX 8WR SPEAKERS. $139.00 (£69-10-0)

PLAYMASTER 101 UNIT WITH TUNER

- **Output 12 watts per channel (24 watts).**
- **Incorporating Ferguson grain oriented output transformers giving a frequency response of 20 to 30,000 cycles.**
- **Valves 4 6GW8, 12AX7, 6N8, 6AN7, EM84 and two 210 rectifiers.**

AMPLIFIER AND TUNER $113.00. WITH GARRARD AT5 STEREO CHANGER AND TWO ROLA 12PX SPEAKERS, $159.00 (£79/10/0).

ALL PRICES F.O.R. SYDNEY

NEW PLAYMASTER 4 AMPLIFIER with TUNER

COMPLETE STEREO SYSTEM

- Playmaster 4 amp with tuner.
- Garrard Autoslim Changer.
- 2 Playmaster Bookshelf Speakers.
- Control Cabinet as illustrated. in Maple, Rosewood, or Walnut.

Teak $7.00 extra. Legs for Control Cabinet if required, $2.50 extra.

$216.00 Freight and packing extra.

(£108-0-0)

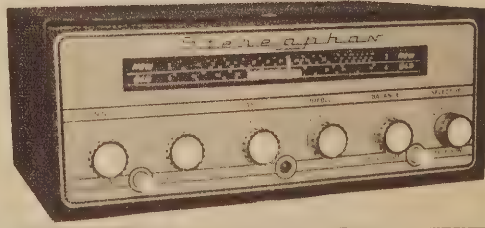
Amplifier and Tuner supplied with two Magnavox 8WR or Rola 8MX speakers and Garrard Autoslim record changer.

(£63-15-0) $127.50 F.O.R.

- Output 8 Watt per Channel (16 Watts).
- Ferguson O.P.412 Oriented Grain Output Transformers with a frequency response of 20 to 30,000 cycles.
- Inbuilt Tuner with EM84 Tuning Indicator, Calibrated Dial Scales. Available for all States.
- Valves 4-6GW8, 12Au7, 6N8, 6AN7, EM84 and 2-210 Rectifiers.
- Switching and Input Facilities for Pick-up and Tape Recorder (Stereo or Mono).
- Supplied in self-contained case finished in grey baked enamel with Control Panel in black and silver with matching knobs.
- Fully Guaranteed.

AMPLIFIER and TUNER

(£46-15-0) $93.50 Plus Freight

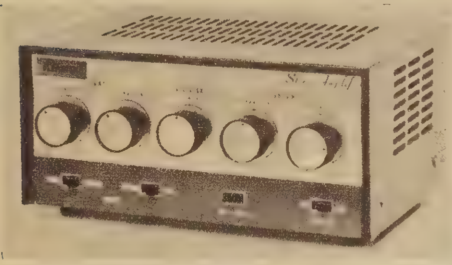


CLASSIC RADIO

245 PARRAMATTA RD.,
HABERFIELD, N.S.W.
Telephone: 71-2145

A COMPLETE HI-FI SYSTEM (less cabinets) FOR $74.00 (£37) freight and packing extra

"CENTRAL" IMPORTED STEREO AMPLIFIER WITH SPECIFICATIONS AS FOLLOWS



POWER OUTPUT: 14 watts (7watts per channel).
FREQUENCY RESPONSE: 40 to 15,000 cycles plus or minus 1 db.
HARMONIC DISTORTION: Less than 1 per cent.
OUTPUT IMPEDENCE: 4, 8 or 16 ohms (each channel).
SELECTOR SWITCH: Phono, tuner, auxiliary.
TONE CONTROL: Better than plus minus 14 db at 10,000 cycles.
VALVE COMPLEMENT: 1-12AX7, 2-6BQ5, 1-6CA4.
MODE SWITCH: Stereo-mono.

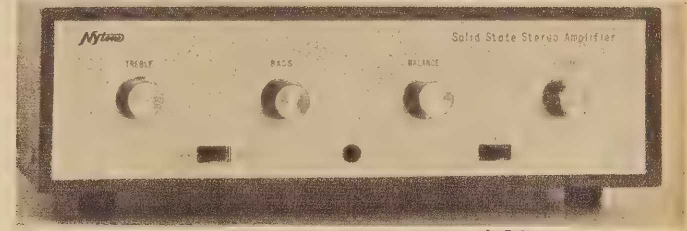
PLUS — Garrard Stereo Player or changer with Ronette 105 crystal cartridge and two Rola 8CMX or Magnavox 8WR Wide Range Speakers

---

NEW "NYTONE" SOLID STATE HI-FI STEREO AMPLIFIER

SPECIFICATIONS

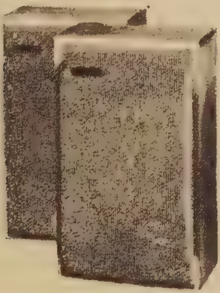
OUTPUT POWER: 6 watts, 3W + 3W.
FREQUENCY RESPONSE: 50 to 15,000 cycles.
OUTPUT IMPEDENCE: 4 to 16 ohms.
TRANSISTORS: 10 transistors plus 2 diodes.
SELECTOR: Tuner or phono.



MODEL STR700 **$40**

THE NEW PLAYMASTER BOOKSHELF LOUD SPEAKER SYSTEM

AS FEATURED IN DECEMBER, 1964, ISSUE OF RADIO AND HOBBIES



CABINET DIMENSIONS 18" x 12" x 7"

This provides the ideal speaker combination, where space is limited, for use with any of the amplifier units listed on the opposite page.

Complete kit of parts for cabinet including silk and innabond padding, 6WR Magnavox and Rola 5FX speakers, 100 ohm variable res., 4mfd. condenser and inductance.

$25.00 Post and packing extra.
N.S.W. $1.50 Vic., Qld., Tas.$2.20 W.A. and S.A. $3

Unit built polished and wired in Rosewood, Maple or Walnut. — Teak finish $1.00 extra. **$30.00**

Complete kit of parts less cabinet but including speaker, condenser, resistor, inductance innabond padding and speaker silk. **$17.50**
Post and packaging $1.25 extra.

The above speaker system now available with Magnavox 8WR or Rola 8MX speakers in place of the 6WR, as featured in September Electronics Australia.

Cabinet dimensions 21½ x 13¾ x 8¼.
Unit built, polished and wired in Rosewood Maple or Walnut—Teak $1.50 extra.

$35.00 Freight extra.

Complete kit of parts less cabinet but including speakers, condenser, resistor, inductance, innabond padding and speaker silk.

$19.50 Post and packing, $1.50 extra.

CLASSIC RADIO

245 PARRAMATTA ROAD, HABERFIELD, N.S.W. PHONE 71-2145

ARROW

ARE PLEASED TO ANNOUNCE THE ARRIVAL OF FURTHER SUPPLIES OF . . .

The world's finest acoustic grille cloth!

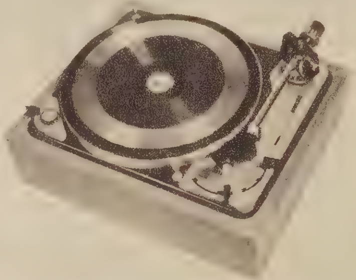
ACOUSTONE

OVER 50 PATTERNS

. . . the cloth with a thousand uses

We NOW have OVER 50 different patterns on display for you to choose from! Call in and make your choice from this fabulous array of patterns and colours. There IS ONE to suit YOU!

NOW AVAILABLE and well worth waiting for — the **NEW "DUAL 1019"** Auto professional turntable. With all the features of the well known 1009 — **PLUS** Direct dial, continuously variable Anti-skating compensation for any tracking force from O-grams up. Feather-touch "stick shift" Cue control for both manual and automatic start. Single play spindle that rotates with your records exactly as with manual turntables. Cartridge holder adjustable for optimum stylus overhang. "PAUSE" position on rest post for placing tone arm without shutting motor off. 1 gram tracking **no problem** to the 1019!



Arrow's **Buy of the Month.** The well known **Thorens TD135 Turntable,** complete with the popular Shure M44-7 stereo magnetic cartridge at a never to be repeated low, low price.

Features 4 pole induction motor, dynamically balanced. Combination belt and idler wheel drive. Eddy current brake allows plus and minus 3% speed variation. Heavy main spindle of hardened steel, ground and polished. 12 inch 7lb non ferrous turntable. 4-speed with **inbuilt** arm lowering device. **$123.00**

Further supplies have arrived of the very popular **STAR SA30** Amplifier. Suitable for Magnetic or Ceramic cartridges. 8 watts of good clean sound per channel at a price you can afford. Hurry while stocks last. **$111.80**

NOW AVAILABLE — The **"NIKKO" TRM40** transistorised stereo amplifier. Front panel suitable for use

free standing or for panel mounting 11 watts per channel output — response from 15 cycles to 20,000 C.P.S. — Distortion less than 1% — Input for — Tape head — Mag. phono — Ceramic phono — Tuner and Auxiliary. Dimensions — 11½" W. 3 3/8" H and 9½" D. **$162.50**
Also available, the "PEAK" TRM 40 suitable for free standing use, only **$150.50.**

ARROW

ELECTRONICS PTY. LTD.

NEW STORE FOR STEREO

432 KENT ST., SYDNEY, 29-8580

VARIETY FARE

★ "ELECTRONICS Australia"

★ Staff Review

★ Panel

Devotional

OLIVET TO CALVARY. Wensley-Maunder, John Mitchinson, tenor, Frederick Harvey, baritone, Peter Moorse, organ, with the Choir of the Guildford Cathedral, conducted by Barry Rose.

Interest: Sacred cantata.
Performance: Most enjoyable.
Quality: First rate.
Stereo: Excellent spread and depth.

John Henry Maunder (1858-1920) born in London, was organist and choirmaster to various churches on the outskirts of the capital. Of his many compositions, mostly cantatas, this one "Olivet To Calvary," published in 1904, is probably the best known and most frequently performed in churches, particularly around the Easter period.

Written for chorus and solo voices, tenor and baritone, and interspersed with hymns to be sung by the congregation, it recalls some of the incidents in the days immediately prior to Calvary.

STEREO
Maunder
Olivet to Calvary
JOHN MITCHINSON
FREDERICK HARVEY
Choir of Guildford Cathedral
BARRY ROSE

To my ear, this performance is built on a foundation of magnificent organ sound, sometimes delicate, sometimes massive but which the stereo, the acoustics and the microphone placement seems to locate firmly in a plane well behind the voices.

The solo work is excellent, particularly in the context of the betrayal. So, too, is the chorus, though some may notice slight raggedness and exaggerated sibilants where the sopranos are featured close-up on microphone. But though I mention the point, it did not irk me; the very imperfection seemed to emphasise the very personal nature of this whole composition.

In saying this, I do not necessarily speak for those who might view the presentation as a mere performance, or as just another item in a program. I simply say that I personally found it enjoyable—and moving.

Incidentally, the words are set out in full on the rear of the jacket—an important point to any who are not familiar with them. Copied on to slides, incidentally, these same words will allow the work to be presented to best advantage to an interested audience.

Musically and technically, a record that I can recommend. (W.N.W.)

★ ★ ★

THE FIRST EASTER. The Laymen Singers. Directed by Ralph Carmichael. Mono, Sacred LP-9017. (Gospel Film Ministry).

Interest: Easter hymns.
Performance: Stirring.
Quality: Excellent.

In case you do not know them, the "Laymen Singers" group is composed of businessmen, school teachers, artists and musicians—men from all walks of life, in fact, who have dedicated their talents to Gospel singing. Their weekly radio program is broadcast throughout the U.S. and overseas.

In November last, I reviewed one of their albums on another label and there it rated "Performance — Excellent, Quality — Excellent." This one rates equally well—a magnificent presentation of Easter hymns, mainly choral but broken with some excellent solo work and a brass choir which proclaims the triumphant message "Up from the grave He arose."

The full list of hymns: "When I Survey The Wondrous Cross"—"All Hail The Power"—"Beneath The Cross Of Jesus"—"I Walked Today Where Jesus Walked"—"Stand Up, Stand Up For Jesus"—"Were You There"—"Christ The Lord Is Risen Today"—"Christ Arose"—"Holy City"—"Faith Triumphant."

While appropriate to the Easter period, these are hymns which are sung the year round and which you will want to play the year round, the more so because the quality in the technical sense, makes the performance. Recommended. (W.N.W.)

★ ★ ★

ONLY ONE LIFE. Sonny Moreno Sings. Arranged and conducted by Paul Mickelson, Stereo, Supreme S-205. Also available in mono M-105. (Southwell Supplies. 176 Geelong Road, Footscray W11, Vic.).

Interest: Newer Gospel songs.
Performance: Unexcelled.
Quality: Excellent.
Stereo: Modest but adequate.

Mitchell A. (Sonny) Moreno, a new name to this reviewer, is introduced in the jacket notes as a one-time night spot singer, who turned aside from a promising career in television to take up full-time Gospel singing.

And what a Gospel singer he is, with a voice that is both pleasant and relaxed, yet powerful in its impact and conviction. There is not an untidy note or phrase in the whole disc, indicative of Sonny Moreno's training in the hard school of commercial entertainment.

The backing, too, under Paul Mickelson is of a high standard, both in concept and execution. Instruments used in the various numbers are piano, celeste, Hammond organ, pipe organ, marimba, vibraharp, chimes, temple blocks, guitar and bass.

The songs are mainly recent compositions, with well developed rhythms but never irreverent or vulgar: "Only One Life," "Teach Me Lord To Wait," "Come With Your Heartaches," "I'd Rather Have Jesus," "I Cannot Hide From God," "Headin' Down The Trail," "Each Step Of The Way," "This Ship of Mine," "When I Met My Saviour," "Why Not Try Prayer," "King of Kings," "His Love."

This is one I can heartily recommend, especially as it should appeal equally to teenagers or adults. (W.N.W.).

★ ★ ★

HYMNS OF PRAISE. Choir conducted by Ivan Rixon. Organ, Eric Smith. Stereo World Record Club. S-7092. Also available in mono.

Interest: Well-known hymns.
Performance: Commendable.
Quality: Mostly good.
Stereo: Modest but adequate.

Traditional hymns can be—and have been—treated in a variety of ways but it is probably true that they have their greatest impact and appeal when heard as originally intended—in solid, four-part

"INNERBOND" (Regd.)
BONDED ACETATE FIBRES
For packing in
SPEAKER ENCLOSURES
A new resilient Bonded Wadding made from ultra fine Cellulose Acetate Fibres that gives high efficiency for Sound Absorption.
"INNERBOND" is light, clean dust free and easy to handle. Because all the fibres are bonded "INNERBOND" will hang as a "curtain" and will not fracture or break down due to vibration.
"INNERBOND" is odourless, highly resistant to attack by bacteria or fungus and is vermin repellent: "INNERBOND" at 16oz sq. yd. has a nominal thickness of 1" and at this density is recommended as a packing in Speaker Enclosures for Sound Absorption.
STOCKISTS
SYDNEY—Arrow Electronics Pty. Ltd., 432 Kent St.; Broadway Electronics Pty. Ltd., Broadway and City Rd.
MELBOURNE—J. H. Magrath and Co. Pty. Ltd., 208 Little Lonsdale St.
BRISBANE—A. E. Harrold Pty. Ltd., 123 Charlotte St.
ADELAIDE—Duncan Agencies, 57 Woodville Rd., Woodville; General Accessories, 81 Flinders St.
PERTH—General Accessories, 46 Milligan St.
If unobtainable
For 1 sq. yd. as above send $2.00
For 2 sq. yds. as above send $3.75
For 4 sq. yds. as above send $6.50
Postage paid in Australia and Territories.
to the manufacturers
WONDER WOOL
PTY. LIMITED.
87 James Street, Leichhardt, N.S.W.
BOX 548 — G.P.O., SYDNEY.
Phone: 56-2780.

EASTER SPECIALS

FROM SYDNEY'S
FINEST LISTENING
CENTRE
"MASTERSOUND
SOUND CELLAR"

THORENS TD 135
turntable with Pickering V15/AME 1 eliptical stylus $134

GARRARD AT6
record changer with Pickering V15/AM1 cartridge. Star SA-30 10-watt amplifier and two Goodmans Twin Axiette 8" speakers $202

GARRARD 401
transcription turntable with world famous SME 3012 Series II pick-up arm and Pickering V15/AME 1 eliptical stylus $232

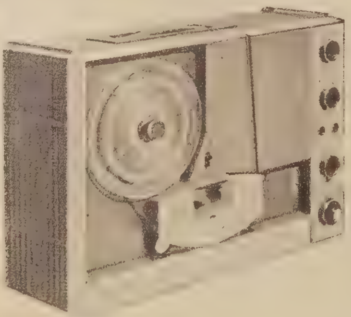
DUAL 1009
record changer with Pickering V15/AM1 cartridge, Nikko solid state TRM40 amplifier 11 watts/channel and two Goodmans Twin Axiette 10" speakers $289

If you are thinking of stereo systems or components. then before you buy call in and see our wide range of Turntables, Cartridges, Amplifiers, Tape Decks, Loudspeakers and Pick-up Arms. We can offer you outstanding service unsurpassed in Sydney, including planning and advice, demonstration, matching and balance of equipment, finance, long warranty and excellent after sales service.

AMPEX
1100 SERIES

STEREOPHONE
TAPE RECORDER/PLAYER

NOW
FULLY SOLID STATE



The new transistorised AMPEX 1100 will deliver more performance and more features than any other tape recorder on the market. It is a medium priced recorder and an investment in years of fine music and enjoyment.

FEATURES

Automatic loading, automatic reversing, 3-speed operation, plays in both directions, Split level record meters, Interlocked tape controls, Ease of operation, etc.

MASTERSOUND
SALES PTY. LIMITED
LIDO HOUSE, 400 KENT STREET, SYDNEY. 'PHONE 29-1527

harmony, with resonant backing from a church organ.

This is how they are presented here, by a specially assembled choir under the baton of Ivan Rixon and recorded originally, I understand, by E.M.I. engineers in Sydney. Ivan Rixon, as the jacket notes point out, is widely experienced as a choral conductor, ranging from church choirs to operettas and operas, performed for the Elizabethan Theatre Trust, the Conservatorium of Music, N.S.W., and the Australian Broadcasting Commission.

Eric Smith, playing here a suitably voiced electronic instrument, is also an organist of wide experience, who provides just the right style and weight of accompaniment.

The hymns, to the traditional tunes, are: Praise To The Holiest In The Height — There Is A Green Hill—Eternal Father Strong To Save — Jesus The Very Thought Of Thee — Lead Us Heavenly Father—Love Divine—When I Survey The Wondrous Cross — Fight The Good Fight — Jesus Lover Of My Soul—Immortal, Invisible—Dear Lord and Father Of Mankind — How Sweet The Name of Jesus Sounds.

As an album of traditional hymns, very well presented in the traditional manner, this is well worth a hearing. The only point of criticism is a slight amount of tracing distortion on the innermost tracks, which may show up on wide range gear. (W.N.W.)

Readers who follow our devotional reviews may also be interested in the classical organ items opposite and the choral albums on page 121.

BILLY GRAHAM CRUSADE ECHOES with Don Hustad and Tedd Smith. Stereo, Word (Gospel Film Ministry) WST-8316-LP.

Interest: Popular Crusade musicians.
Performance: Facile.
Quality: Good.
Stereo: Well spread.

To those who attended Billy Graham's Australian crusades a few years back, pianist Tedd Smith will need no introduction. With his keyboard interpretations of Gospel melodies he intrigued and entertained the huge crowds that attended the meetings.

Don Hustad is his associate artist and counterpart at the console, playing here "the giant Robert Morton organ," probably the same Wurlitzer-like instrument which has been used by Paul Mickelson for some of his recordings.

Needless to say, Tedd Smith and Don Hustad acquit themselves extremely well and the record should certainly please all those with a personal interest in the artists and/or a liking for variation and embellishment.

The titles (duet arrangements except where otherwise mentioned) are: Am I a Soldier Of The Cross — Grace Greater Than Our Sin — A Mighty Fortress Is Our God (piano) — Art Thou Weary, Heavy Laden (organ) — The Beautiful Garden Of Prayer — Jesu Joy Of Man's Desiring — Lead Me To Calvary — O Could I Speak The Matchless Worth — Go Down Moses (piano) — Wonderful Words Of Life — Sunlight (organ) — The Lord Is My Light.

An American import pressing, the quality is well up to standard and the stereo is well enough spread to pick out the two ends of the piano. (W.N.W.)

ORGAN — Classical and Popular

GREAT CATHEDRAL ORGAN SERIES: COVENTRY CATHEDRAL. Organist David Lepine. HMV 12in stereo, OCSD 1609. (Also in mono on OCLP 1879).

Interest: Classic organ.
Performance: Very capable.
Recording: Excellent.
Stereo: Smooth.

A further release in HMV's series featuring famous cathedral organs played by their resident organists, this disc presents the organ of the new Coventry Cathedral, played by its organist, David Lepine.

The specification of the organ appears on the record sleeve; it is a four manual instrument, built by Messrs Harrison and Harrison. Approximately half of its 73 stops are mounted on galleries at either side of the High Altar, with the console in the choir stalls. Judging from the stop-list and the tracks on the disc, it is equally suited to Baroque or Romantic music.

David Lepine plays the instrument very capably and on the whole in a very satisfying fashion. In one or two places he invites the charge of over-registration and his phrasing is not always as profound as one would like; but as a demonstrator of the organ's capabilities, he does a good job.

The pieces played are as follows: Two "In Dulci Jubilo" chorale preludes by J. S. Bach, the well-known BWV 608 and the less familiar BWV 729; the Passacaglia in D Minor by D. Buxtehude; Liszt's "B.A.C.H." Prelude and Fugue; a delightful little Cornet Voluntary (No. 5) by Walond; a chorale by the contemporary Peeters—"Herders, hij is gebooren" (Op. 39, No. 2); "Te Deum" by fellow contemporary Langlais; D. Scarlatti's Organ Sonata No. 288, and the well-known variations on "Mein Junges Leben . . ." by Jan Sweelinck.

The last disc in this series which I reviewed was recorded at a rather high level and tended to cause cartridge embarrassment; I'm happy to report that this disc does not suffer from this fault. The recording level is just right. In fact, the disc is technically quite excellent, with low noise and distortion and smoothly spread stereo.

An excellent recording of a fine instrument and recommended to all organ lovers. (J.R.)

* * *

ORGAN. Eric Rogers at the Kingsway Hall Organ. "The Mighty Colossus of Sound." Stereo, Decca Phase Four SKLA 7609.

Interest: Popular organ.
Performance: Hard to judge.
Quality: Disappointing.
Stereo: Separation featured.

With the apparent idea of creating a stereo super spectacular, Decca engineers set up their multiple mikes and multiple tape tracks to record one of Britain's largest and most versatile pipe organs "which reaches across the entire wall of this huge Methodist hall." To play the instrument, they engaged Eric Rogers, no doubt, on the understanding that he give them plenty to work with!

Unfortunately, the reproduced sound, which issued from my loudspeakers, didn't live up to expectations born of the most enthusiastically phrased jacket notes.

The sound is massive, to be sure, but it lacks many of the other qualities that one might reasonably expect. It certainly isn't clean sound and the difference between the respective channels in both quality and noise level, along with the changing levels of tape hiss and the wide separation, all suggest extensive "manipulation" of the end result. How much represents "knob twiddling" at the recording console and how much double recording would take quite a deal of working out.

Personally, I didn't bother. The effort didn't seem to be worthwhile.

The tracks: Fanfare and theme from The Magnificent Seven — Tico Tico — Long Ago — Down Town — Medley — Stars and Stripes Forever — The Girl From Ipanema — One O'Clock Jump — Greensleeves — Can-Can.

Disappointing—on my gear anyway. (W.N.W.)

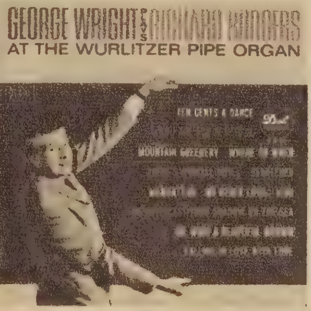
* * *

GEORGE WRIGHT PLAYS RICHARD ROGERS AT THE WURLITZER PIPE ORGAN. Stereo, Dot (Festival) SZL-931,799. Also available in mono ZL-31-799.

Interest: Big Wurlitzer sound.
Performance: Tremendous.
Quality: Mostly good.
Stereo: Lots of separation, spread.

George Wright's own Wurlitzer pipe organ, installed in its special recording studio, must be one of the most comprehensive ever of its class and one of the most carefully maintained. Since making the last recording, according to the jacket notes, George Wright has added to the organ a set of Skinner 16ft wood violone pipes and a rank of fifty-year old Hope-Jones Tibias, rescued from an old theatre in Denver.

George Wright's own performance is outstanding at the console. He uses a wide variety of voices, yet giving the impression that every change is exactly as he wanted it to be—smoothly executed and appropriate. And his fingering, whether in slow dreamy passages or rocking rhythm with full organ percussion, is flawless.


GEORGE WRIGHT PLAYS RICHARD RODGERS
AT THE WURLITZER PIPE ORGAN
TEN CENTS A DANCE
Dot
MOUNTAIN GREENERY

And, if he's guilty there of double recording, as he is so often charged, then it's done extremely well and only because he has not more limbs than the rest of us! In short, whatever the method, the end result is worth it!

The titles: Ten Cents A Dance — Mountain Greenery — Where Or When — Manhattan — No Other Love — Mimi — Bewitched — There's A Small Hotel — Falling In Love With Love — You Have Cast Your Shadow On the Sea — You Are Too Beautiful — Oh, What a Beautiful Morning.

Technically, the sound is well balanced

NOW OPEN 6 DAYS A WEEK
10 A.M. TILL 5.30 P.M.

DON'T buy your **TAPE RECORDER, HI-FI STEREO** or other **SOUND EQUIPMENT** from just anyone.

BUY ALL YOUR SOUND EQUIPMENT from people who know, use and sell such quality brands as:

OKI, TANDBERG, SONY, AKAI, RADFORD, INSTROL DUAL ELEC, B.A.S.F., KEF, LEAK, HANIMEX, AMPEX, SONOCOLOR and other leading makes with Sydney's greatest range of accessories.

DISC RECORD
STUDIOS

New Sound Information Centre,

124 WILLISON ROAD,
CARLTON, N.S.W.

Take Bus 122 from Hurstville or Kogarah Stations.

Phones 58-8958 or 599-1821.

UNLIMITED FINANCE AVAILABLE. SEE THIS MONTH: SONY 250A TAPE DECK. NEW, HANIMEX RANGE OF TAPE RECORDERS.

Stereo/Mono Pre-Recorded Tape Club. Join the Sonic Pre-recorded Tape Club open to any person within Australia.

Now just commencing. Buy all your tapes at **Large** Savings. Free tape on joining, over 36 Labels to choose from covering hundreds of titles. In joining you save $ on all your Hi-Fi tape recorder needs. So write, phone or call now. Sonic Pre-Recorded Tape Club, Box 77, Rockdale, 124 Willison Rd., Carlton. Ph. 58-8958 or 599-1821.

MAKE LPs OUT OF YOUR TAPES using our tape to Disc Service.

We are pleased to announce that Disc-Record STUDIOS have now introduced a newly equipped Cutting Room, using Grampian Cutter Head and 100-watt amps. Neuman Drive Unit, Nuttal Lathe. To offset this a small price rise has been added, along with a speedy service.

SIZE	R.P.M.	Max. Time	$
7"	45/33.1/3	12 mins.	4.00
10"	33.1/3	15 mins.	6.00
12"	33.1/3	44 mins.	8.00

Mail order clients send remittance plus 50c Post, Pack, Insurance to Box 77, Rockdale, N.S.W.

LEAVE YOUR TAPE NOW AT

DISC-RECORD STUDIOS. Ph. 58-8959, 599-1821. 124 Willison Rd, Carlton, N.S.W.

ALDERSONS CAMERA STORES. Ph. 59-2589, 52-9023. Cnr. King St and Princes Highway, Rockdale.
Shop 6, Newton Buildings, Kingsway, Caringbah.

DOUGLASS BAGLIN PTY. LTD., 43-6311. 100 Pacific Highway, St. Leonards, N.S.W.

ALEN PRICE PHOTOGRAPHIC. Shop 20, 50 George St, Parramatta, N.S.W.

MEECO. Smith St, Naracoorte, South Australia.

M. & R. ELECTRONICS. Ph. CANB. 4-2975. 309 Antill St, Watson, A.C.T.

R. J. EASDEN. Ph. Cohuna 118, 16 Hall St, Cohuna, Vic.

GOODMANS
MAXIM
MINI-SYSTEM
GOODMANS

TRUE HIGH FIDELITY FROM THE MOST COMPACT LOUDSPEAKER SYSTEM EVER!

MAXIM—no bigger than a stout book—it's a complete system in miniature.

Incredible?—that a true full-range High Fidelity Loudspeaker system with a range of 45—20,000 c/s can be housed in an enclosure 10½" x 5½" x 7¼" deep.

See one for yourself

Unbelievable?—that up to 8 watts of power can be handled by the MAXIM with easy grace.

Hear one for yourself.

GOODMANS

MADE IN
ENGLAND

Inconceivable?—that such a tiny enclosure, so meticulously finished (in teak or walnut to order) can give full range High Fidelity and still cost you only **$89.00 (£44/10/-)**

Buy one for yourself (or two-the Maxim is ideal for stereo)

Send this coupon to address below for full details of Goodmans Maxim, free and post free.

Name

Address

State

Sole Australian Agent: British Merchandising Pty. Ltd., 60 Clarence St., Sydney, N.S.W. Telephone 29-1571 and well spread, with a high order of separation, where intended. Here and there, your stylus may produce wisps of tracing distortion in protest at the weight and amplitude of the sound but I don't think that this will prevent popular organ enthusiasts from wanting to add this one to their collection.

In fact, I was left with the feeling that, by coincidence Dot had come up with the kind of spectacular that Decca tried for—without the head start conferred by George Wright and his ambitious set-up. (W.N.W.)

★ ★ ★

ORGAN MASTERPIECES. Robert Munns at the organ of Holy Trinity Anglican Church, Brompton, London. Console (Supreme) 12-inch mono, CM-5002. Also in stereo on CS-6002. (Southwell Supplies, 176 Geelong Road, Footscray, W.11, Vic.).

Interest: Classic organ.
Performance: Restrained, but warm.
Recording: Excellent.

Noteworthy young British organist Robert Munns studied the organ at the Royal Academy under Arnold Richardson and Douglas Hawkridge, and in July 1957 won both the Keene Memorial Prize for organ playing and extemporisation and the Read Prize for conducting. In addition to his duties as organist and director of music of Holy Trinity Church, he is a busy recitalist and has played on many famous British organs.

Here he plays on his "home base," as it were, on the rebuilt Kingsgate-Davidson three-manual instrument transferred to the church in 1945 from the residence of Lawrence Ide on the advice of the Rev. Noel A. Bonavia-Hunt (author of "The Modern British Organ."). And a fine instrument it sounds, of sturdy English tonal architecture, to be sure, but in the main extremely well voiced and regulated and quite versatile, despite a rather light-on array of upper-work.

The pieces played by Mr Munns make varied listening. From the 17th-century composer Nikolaus Bruhns there is a Prelude and Fugue in E minor; two delightful little Noels by Nicolas Le Begue (1630-1702); the well-known Prelude and Fugue in A minor and the delightful Chorale Prelude "Ich Ruf Zu Dir" by J. S. Bach; a "Theme and Variations" by 20th century organist Hendrik Andriessen, dedicated to Baroque authority Lady Susi Jeans in 1949; Dr Herbert Howells' lyrical Prelude to Psalm 34, v. 6; and finally "Carillon" by Herbert Murrill.

The playing is extremely good; perhaps a trifle restrained, but with a good deal of warmth and sensitivity. The organist commendably resists the temptation to draw all the bass stops with which he has been so amply supplied and, in almost all places, achieves quite splendid tonal balance. It makes extremely pleasant listening indeed.

While only mono, the recording review was of quite excellent quality, with neither noise nor overload distortion to mar the performance.

All in all, then, a fine recording and one which may be recommended to all lovers of classic organ music. (J.R.)

Instrumental, Vocal & Humour

BROADWAY HITS FROM NINE GREAT SHOWS.—Johannes Fehring and His Orchestra. Festival 12-inch stereo, SFL-931, 820. Also in mono on FL-31, 820.

Interest: Show music.
Performance: Somewhat detached.
Recording: Fine.
Stereo: The same.

Another disc of music from the Broadway shows, this time from Austrian Johannes Fehring and his orchestra. They play most competently, but to my ears rather dryly; as a result the disc seems best suited for dancing at parties rather than for relaxed listening.

The tracks are: Ol' Man River—Can't Help Lovin' That Man—Some Enchanted Evening — The Lady is a Tramp — There's a Small Hotel — It's Too Darn Hot — Oh, What a Beautiful Morning — The Surrey With The Fringe On Top — Ohio — I Got The Sun in The Morning — Tonight — On The Street Where You Live.

The recording quality is quite good, with smooth stereo. (J.R.).

★ ★ ★

WHEN IRISH EYES ARE SMILING. The Living Strings Orchestra, arranged and conducted by Johnny Douglas. Stereo, RCA Camden CAS-859. Also available in mono CAL-859.

Interest: Irish airs.
Performance: Sentimental strings.
Quality: Good.
Stereo: Normal spread.

If you want to drift back through the years in sentimental mood, there's probably no better music to help you on your way than a group such as this of popular Irish airs.

Recorded in England, the Living Strings Orchestra, not unexpectedly, has a string-rich sound but the lead is taken frequently by other instruments, even to a well-played harmonica. You get:

When Irish Eyes Are Smiling — The Rose Of Tralee — I'll Take You Home Again Kathleen — Macushla — Little Town In Ould County Down — Sweet Rosie O'Grady — Cockles and Mussels — My Wild Irish Rose — If You'll Only Come Across The Sea To Ireland — It's A Great Day For The Irish — Galway Bay — Wearing Of The Green — Irish Washerwoman — Kerry Dance.

Not the only Irish record by any means but a good one nevertheless. (W.N.W.).

★ ★ ★

LATINO AMERICANO. Franck Pourcel and his Orchestra. Mono, E.M.I. His Master's Voice OCLP 7644. (Also available in Stereo OCSD 7644).

Interest: Latin American.
Performance: Excellent.
Quality: Good.

Frank Pourcel and his Orchestra are well known in musical circles for rich string sound and exciting arrangements. The popularity of this French combination is high among the large European orchestras and the dash of the Latin American melodies presented here upholds this reputation. Amongst the titles on the disc is a new number "Cumbia del Papagayo" composed by Franck Pourcel himself. This composition is jaunty but, to this reviewer's ear,

Peter Clark says,
"I save you
20% off
List Price of
Tape Recorders
with my exclusive T/I. Bonus"
CASH OR TERMS

How? Because I am the biggest distributor of tape recorders in Australia . . . hence I can go for volume and small profits . . . YOU get the savings.

AKAI, NATIONAL, SONY, PHILIPS, SANYO, SHARP, TELEFUNKEN, GRUNDIG.

Exchange Tape Library

You become a FREE member when you buy a tape recorder from Magnetic Sound. Over £1000 worth of mono and stereo pre-recorded tapes — everything from Bach to Bop. (Ask for the catalogue).

Specialist
After-Sales Service

Your best guarantee. With 20 years of specialist service behind him, Peter Clark has a reputation, to back up. That means you won't be left for dead after you make your purchase. Guarantees plus on-the-spot workshops look after your recorder.

Magnetic Sound
INDUSTRIES

387 GEORGE STREET (2 doors from Kodak)
29-3371
A.M.P. Building, 20 Macquarie St.,
Parramatta. 635-0830.

falls short of the other melodies featured.

The other tracks presented are: Cielito Lindo — La Bamba — Malaguena — Adelita — Noche de Ronda — Quiereme Mucho — Alma Llanera — The Peanut Vendor — Perfidia — La Cucaracha — Tres Palabras.

The established popularity of these numbers, with the excellent arrangements and the fine performance of Franck Pourcel's Orchestra, has produced an album which should prove to be very popular. (K.W.)

* * *

STEREO SAMPLER

DOT STEREO SAMPLER. Twelve tracks from 12 great Dot artists. Dot (Festival) 12-inch stereo, SZL-2/5.

Interest: Demonstration, sampling.

Performance: Bright.

Recording: Excellent.

Stereo: Smoothly spread.

Yet another stereo sampler disc—but this one's a beauty. It has sample tracks from Dot recordings which span almost the complete gamut of popular music (and beyond?): from organist George Wright chuffin' and chirpin' his way through Richard Rogers' "Mountain Greenery" all the way to "The Surfaris" with the frenetic surfie tune "Wipeout." In between these two extremes (I think) are:

"Hello Dolly" from Johnny Maddox, "A Walk In the Black Forest," from Billy Vaughn and his orchestra "Blue Velvet," from Lawrence Welk, "Tea For Two" from Liberace, "Big Noise from Winnetka" from Bob Crosby and the Bobcats—"Red Roses for a Blue Lady' from Harry James, "Chicago" from Milt Rogers, "Guitar Boogie" from Arthur Smith, "The Girl From Ipanema" from Eddie Baxter and "Aloha Oe" from Eddie Peabody.

A really wide sample of pop music, and the recording quality is excellent. Recommended to all who need a sampler to show off their system or want a disc with variety. (J.R.)

THE ARTISTRY OF FERRANTE AND TEICHER. Arthur Ferrante and Louis Teicher, duo pianists. Universal Record Club, Stereo SUP-697.

Interest: French classics arranged for duet.

Performance: Skilful execution.

Quality: Good.

Stereo: Not significant.

I assume that purchasers of this disc will be those who have a taste for (1) twentieth-century French music and (2) arrangements for piano duet. For this group of listeners, I can recommend this record, since the arrangements are tasteful, the execution skilful and the sound quality is good. All the pieces presented here are adaptations from orchestral works of Ravel and Debussy. Ravel is represented by the choreographic tone poem "La Valse," which is meant to be a distillation of the essence of the Viennese waltz; the famous "Bolero," in which a continually repeated theme is saved from monotony by changing orchestral colouring and harmonic texture; and the ballet suite "Ma Mere L'Oye," otherwise known as the "Mother Goose" suite.

The Debussy pieces are two of th three nocturnes for orchestra, "Nuages' and "Fetes." The third, "Sirenes," obviously had to be omitted because i would be quite impossible to represen the section for female choir (singing wordlessly with long, sustained notes).

All these items sound very well in the piano duet arrangements except tha

There's an AIWA microphone to solve your recording problem.

AIWA DM.57 DYNAMIC MICROPHONE—Impedance: 60 and 50K. Frequency Response: 100-13,000 cps. Sensitivity: 75 db's. Dimensions: 7¾" x 1¾". Weight: 14 ozs. **$16.80**

AIWA DM.17 OMNI-DIRECTIONAL DYNAMIC BOOM MICROPHONE—Impedance: 50K or 50Ω. Frequency Response: 70-14,000 cps. Sensitivity: 75 db's. Dimensions: 55⅝" x 1⅝". Weight: 10½ ozs. **$16.80**

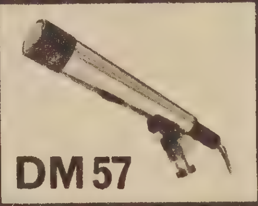
AIWA DM.51 DYNAMIC MICROPHONE. Impedance: 50Ω or 50KΩ. Frequency Response: 50-15,000 cps. Sensitivity: 55 db's. Dimensions: 10" x 1⅜". Weight: 29 ozs. **$27.00**

AIWA DYNAMIC NON-DIRECTIONAL MICROPHONE DM.13—Impedance: 50K or 50Ω. Frequency Response: 60 c's-14,000 cps. Sensitivity: 55 db's. Dimensions: Length 10½". Weight: 18½ ozs. **$23.00**

AIWA UNI-DIRECTIONAL DYNAMIC MICROPHONE DM.47—Impedance: 50Ω or 50K. Frequency Response: 40-18,000 cps. Sensitivity: 75 db's. Dimensions: 5½" x 1 3/16". Weight: 18 ozs. with cord. **$36.00**

AIWA DM.10 DYNAMIC DESK MICROPHONE—Impedance: 50KΩ or 50Ω. Frequency Response: 60-13 Kc's. Sensitivity: 75 db's. Dimensions: 7¼" x 1¼". Weight: 11 ozs. without stand. **$16.80**

AIWA DM.14 DYNAMIC MICROPHONE—Impedance: 50Ω or 50K. Frequency Response: 90 c's-14,000 cps. Sensitivity: 75 db's. Dimensions: 3⅜" x 1¾". Wt. 10 ozs. **$12.50**



GE:P264

Distributed by:

GOLDRING

ENGINEERING (A'ASIA) PTY. LTD.

N.S.W.	443 Kent Street, Sydney	29.1276
VIC.	368 Little Bourke Street, Melbourne	67.1197
QLD.:	235 Edward Street, Brisbane	2.3247
W.A.:	144A William Street, Perth	21.6500
S.A.:	77 Wright Street, Adelaide	51.5117

the middle section of "La Valse" seemed to flag a little. The changing texture of the "Bolero" is skilfully represented and the "Mother Goose" arrangements are lively and interesting. To my mind, the Debussy pieces are not quite so successful, but this is probably because of a personal preference for the original orchestral versions. (H.A.T.)

* * *

THE IAN POWRIE BAND SHOW. Ian Powrie with his Scottish band. EMI, Mono OCLP 7640.

Interest: Scottish "party music."
Performance: Competent but unpretentious.
Quality: Good.

There is an air of modesty about the performance of Ian Powrie and his band on this disc. All attempts at virtuosity are eschewed, but those who favour the Gaelic variety of music and dancing are rewarded with a competent playing eminently suitable for a party at home. Some of this is suitable for dancing (reels, Gay Gordons, Gaelic waltzes, three steps and strathspeys) and the rest is good entertainment between the dances for recuperation periods. The mood varies widely, from the gay and spritely to the soulful and doleful. For those with a taste for Scottish music—recommended.

The list of tune titles is too long for reproduction here, but the 13 tracks are entitled: The Queen's Welcome — The Flower of the Queen — The Garry Strathspey — Harmonica Tricks — The Hamilton Rant — The Heather on the Hill — The Gay Gordons — The St. Johnstoun Reel — Bandboys — Gaelic Waltzes — Seaside Scottische — The Eva Threestep — Bovaglie's Plaid — Medley: Because He Was a Bonny Lad. (H.A.T.)

* * *

THE MANY SPLENDOURED GUITARS OF LOS INDIOS TABAJARAS. RCA Dynagroove 12-inch stereo, LSP-3413. Also in mono on LPM-3413.

Interest: Popular guitars.
Performance: Cool, real cool.
Recording: Fine.
Stereo: A little exaggerated.

An easy-to-listen-to disc of familiar avourites from the popular Brazilian guitar duo Los Indios Tabajaras. About he best way I can sum it up is "cool, eal cool." The arrangements are mooth and relaxed, yet by no means without interest; the playing is likewise.

The tunes played are: Love is a Many Splendoured Thing — I'm Getting Sentimental Over You — Begin the Beguine — The Washington Flowers — Harbour Lights — You're Breaking My Heart — Lisboa Antigua — The Greatest Story Ever Told — Johnny Guitar — La Nocia The Wedding) — Luna Rosa (Blushing Moon) — Comme Ci, Comme Ca.

The recording quality is fine. Stereo eparation is somewhat dichotomous, but his will no doubt be an advantage in nost cases (J.R.).

* * *

LAY ME A COUNTRY SONG, "Big" Tiny Little. Festival, Mono CL-31,811.

Interest: Popular entertainer with piano.
Performance: Polished.
Quality: Very good.

In this record, "Big" Tiny Little strums is way in his personable style through round dozen popular songs, which aparently originated in the American

E M P I R E

WORLD'S MOST PERFECT MONO-STEREO CARTRIDGE
Manufactured in U.S.A. Sole Agents for Australia — TRUE FIDELITY

SERIES 888 CARTRIDGES

MODEL 888
Freq. Resp.: 12-24,000 cps
Compliance:
10 x 10^{-6} cm/dyne
Tracking wgt.: ¾-6 gms.
Stylus: .7 mil Diamond.
Price: £16/-/-

MODEL 888PE
Freq. Resp.: .6-30,000 cps.
Compliance:
20 x 10^{-6} cm/dyne.
Tracking wgt.: ½-3 gms.
Stylus: .2 x .9 Radial
Elliptical Diamond.
Price: £26/-/-

MODEL 888P
Freq. Resp.: 8-28,000cps
Compliance: 15 x 10^{-6} cm/dyne
Tracking weight: ½-4 gms.
Stylus: 6 mil Hand Polished Diamond
Price: £18/-/-

Star attraction from the
NEW EMPIRE Speaker Range
The Royal Grenadier 9000
Freq. Resp.: 20-20,000 cps.
Power Handling Capacity: 20-450 cps 60 watts; 450-5,000 cps 40 watts; 5,000-20,000 cps 20 watts.
Speakers: 15" High Compliance Woofer with 4" voice coil, Mid range direct radiator ultrasonic domed. Tweeter.
Weight: 120 lb. Height: 29"
Complete with imported marble top.

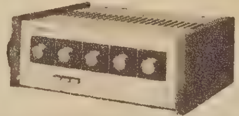
Complete weight of cartridges only 7 grams employing Empires exclusive magnetic cone stylus —the lightest moving mechanism yet developed—15 degrees vertical tracking angle —Channel Separation more than 30 dB—Output: 8.0 mv channel—Signal to noise ratio 80dB.

ASK YOUR DEALER FOR

EMPIRE *THE FINEST CARTRIDGE IN THE WORLD*

ARMSTRONG

WORLD'S BEST AMPLIFIER
MADE IN ENGLAND
SOLE AGENTS FOR AUSTRALIA
TRUE FIDELITY—23 COLLINS ST., MELBOURNE



221 INTEGRATED STEREO AMPLIFIER
Shown in optional case of solid teak and vinyl-hide.

ENTIRE EMPIRE SPEAKER RANGE ON DEMONSTRATION AT RECORDED MUSIC SALON

TECHNICAL SPECIFICATION

The specification refers to overall performance and this should be borne in mind when comparing figures with amplifiers and control units quoted separately.

Power Output: 10 watts push-pull per channel, R.M.S.
Frequency Response: 30-20,000 c.p.s. ± 1dB.
Power Response: 35-20,000 c.p.s.—1dB.
Harmonic Distortion: Less than 0.5% at 1K/cs measured at 8 watts output ± 1dB.
Hum and Noise: 55dB below rated output.
Negative Feedback: 15dB.
Output Impedance: Alternative 4, 8, 16 ohms.
Transient Response: Rise time 6 micro-secs.
Crosstalk: Better than 40dB.
Channel Matching: ± 1dB.
Balance Control: Range of—10dB each channel
Treble Control: · 15dB.,—12dB, at 10K/cs.
Bass Control: + 12dB,—12dB, at 70 c.p.s.
Loudness: Switched. Superimposes increase in extreme bass and treble at low volume.
Rumble Filter: —6db at 35 c.p.s. increasing at lower frequencies.
Treble Filter: 8 K/cs. with slope of 12db per octave above this frequency.
Input Sensitivity: Five pairs of stereo inputs as follows:
Pickup 1, Tape, Radio. 80mV at 2M ohms.
Pickup 2 (magnetic pickups) 3.5mV at 50K.
Tape Monitor 600mV at 100K.
Tape Recording: 500mV output, Low impedance.
Valves & Semi-Conductors: 4 x ECL86, 2 x ECC83, 2 x AC107, 2 x OC71 2 x BY114.
Power Supplies: AC 200-250 volts. Dual voltage (100-130, 200-250 volts) to order. Consumption 70 watts.
Weight: Net. 14½ lbs, 6.6 kgs. Packed 19 lbs, 8.6 kgs.

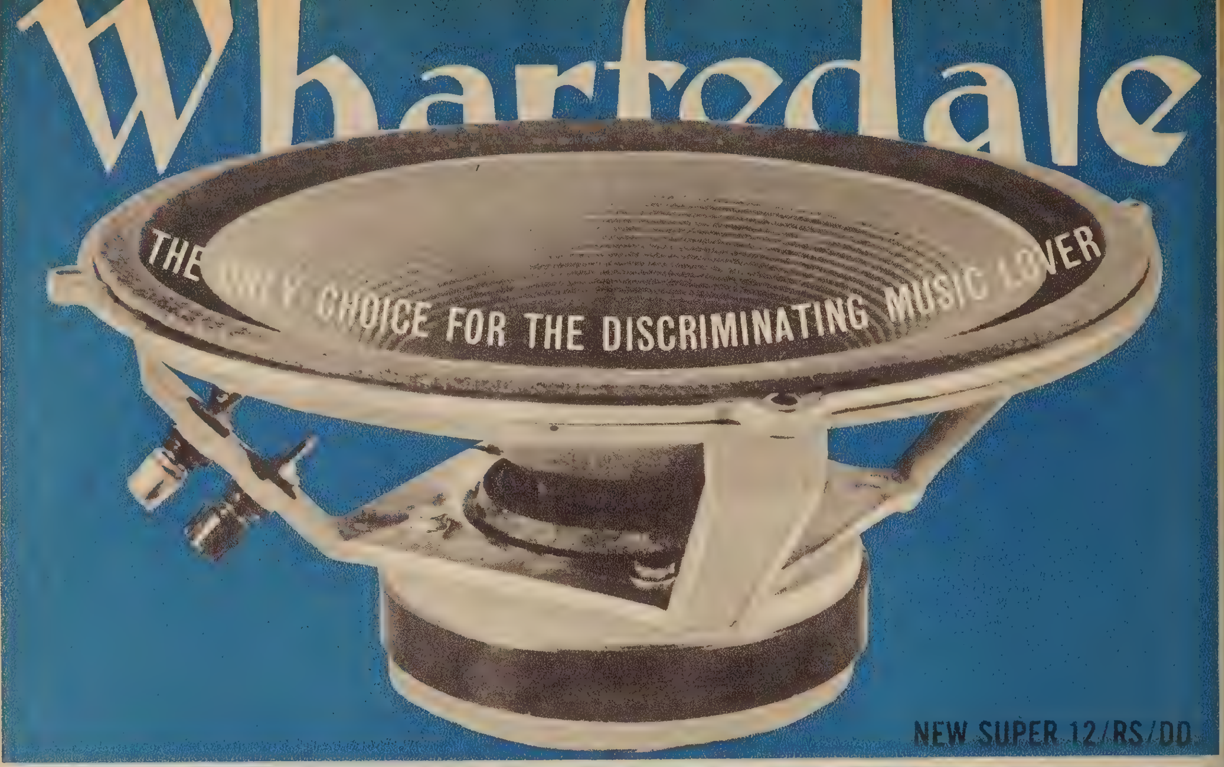
Dimensions

		Width.	Depth.	Height.
Chassis	ins.	12⅜.	10⅝.	4¾.
	cms.	31.4.	26.9.	12.
In Case	ins.	13⅜.	11.	5¼.
	cms.	34.0.	27.9.	13.4.
Cut-Out	ins.	12⅛.	—	4½.
	cms.	30.8.	—	11.4.

Sole Agents for Australia

TRUE FIDELITY (C. PINCZEWSKI)

RECORDED MUSIC SALON, 23 Collins Street, Melbourne: Tel.: 63-6257
WHOLESALE AND TRADE ENQUIRIES WELCOME



NEW SUPER
10/RS/DD

NEW SUPER
8/RS/DD

INSIST ON **Wharfedale** FOR

● SUPERIOR SOUND CLARITY ● SUPERIOR TRANSIENT PERFORMANCE ● SUPERIOR PRECISION ENGINEERING ● SUPERIOR DESIGN TECHNOLOGY

Wharfedale's exclusive roll surround reduces basic resonance and permits greater cone excursion for perfect bass reproduction; high frequency response is extended by Wharfedale's unique double diaphragm. Hear the three new Wharfedale 'Super' models . . . these outstanding speakers easily out-perform any other speaker of similar size or price! Hearing is believing!

THE NEW SUPER 12/RS/DD.

The most advanced wide range 12" high fidelity speaker yet released by Wharfedale — 190,000 maxwells total flux and 40 watts peak handling capacity. Frequency response is substantially linear between 25—20,000 c/s.

THE NEW SUPER 10/RS/DD.

With a frequency response of 30—20,000 c/s, the Super 10 provides perfect performance in a 2 cu. ft. (R2) enclosure. Ideal for stereo, the Super 10 is rated at 20 watts peak handling capacity.

THE NEW SUPER 8/RS/DD.

For smaller lounge rooms, this brillia speaker gives a "sound impression" a far larger unit. Response is 40—20,0 c/s, total flux 60,000 maxwells. Enc sures for this speaker can be as sm as 1 cu. ft. where space is a proble larger enclosures improve bass respon

Australian National Distributors :

Simon Gray Pty. Ltd.

Head Office: 28 Elizabeth Street, Melbourne, Vic. Tel. 63 8211, 63 8166
Sydney Office: 26 Ridge Street, North Sydney, N.S.W. Tel. 92 3890.

INTERSTATE REPRESENTATIVES:
N.S.W.: Audio Engineers Pty. Ltd., 342-344 Kent Street, Sydney. Tel. 29 6
S.A.: Eilco Sales Pty. Ltd., 9 Osmond Terrace, Norwood. S.A. Tel. 3 6345
Q'land: Sydney G. Hughes, 154-158 Arthur St., New Farm, Brisbane. Tel. 58 1
W.A.: Athol M. Hill, 613-615 Wellington Street, Perth. Tel. 21 7861
Tas.: K. W. McCulloch Pty. Ltd., 109 York Street, Launceston. Tel. 2 5322
A.C.T.: Australian Physical Laboratories, P.O. Box 225, Canberra City.
Tel. 4 3010 (Mr. J. E. Howe)
N.T.: Pfitzner's Music House, Smith Street, Darwin. Tel. 3801

countryside. In this, he is aided and abetted by vocal and instrumental groups. The whole thing is done in a very professional manner, with "Big" Tiny showing off all his pianistic tricks, such as tremolo and boogy bass. All in all, it adds up to good entertainment by a seasoned showman, and the sound quality is first class.

The notable feature of this disc is that "Big" Tiny has departed completely from his usual honky tonk and jazz styles to play in straight ballade style. The numbers present are: Jealous Heart — Faded Love — Oh, Lonesome Me — Your the Only World I Know — Jambalaya (On the Bayou) — King of the Road — Your Cheatin' Heart — I Can't Help It — I've Got a Tiger by the Tail — Marla — Cold, Cold Heart — I Can't Stop Loving You. (H.A.T.)

★ ★ ★

THE SOUND OF FOLK MUSIC. The Trapp Family Choir. RCA Camden. Stereo CAS-904 (also available in mono, CAL-904).

Interest: Early Trapp Family recordings.
Performance: Pleasing.
Quality: Pre-war vintage.
Stereo: Electronically rechannelled.

The Trapp family presented here are the famous singing group whose musical career is the basis of the stage and screen musical "The Sound Of Music." If you have not previously heard the group perform, this selection from the recordings with which they established their fame shortly after their arrival in America in 1938 is a good introduction to their art. However, don't expect to hear anything like "Do-re-me" and other songs from "The Sound Of Music." The music presented here is in the form of madrigals and lieder, mostly from the sixteenth century, some by the old masters of these forms, some whose origin is unknown.

All but one of the recordings reissued on this disc were made in December, 1938 (the exception was made in 1939).

Naturally, the sound quality is not to be compared with present day standards, but it is still acceptable, with no noticeable hiss or other surface noise. In any case, it appears that the Trapp family has not made recordings since the introduction of the LP disc, so if you want the real-life Trapp family, rather than the film and stage versions, it appears to be a case of re-issues or nothing.

The English titles of the numbers on the disc are given here in preference to the original German: Innsbruck I Must Leave You — Mary Through The Brambles Walked — The Sweet White Swan—Awake, Awake—Andreas Hofer's Death — Come, Heavy Sleep — Two Old Netherland Dances (arranged for recorder group), Rondo and Pavane —Now, Dear Guests—In A Cool Dale — Soldier's Serenade — Lo, How A Rose E'er Blooming — Late One Evening. (H.A.T.)

★ ★ ★

RIVERBOAT DAYS! The Back Porch Majority. Produced by Randy Sparks, EPIC (C.B.S.). 12-inch stereo, ELPS-3535.

Interest: "Big group" folk music.
Performance: Sparkling!
Recording: Excellent.
Stereo: Smooth and wide.

Some months ago when I reviewed The Back Porch Majority's first disc "Live From Ledbetter's" (ELPS-3526) I was most impressed with their sparkling and vivacious presentation of the "big group" folk sound. On this disc of songs about the heyday of the American riverboat, inspired by the still-operating Greene Steamboat Line's The Delta Queen, they continue at the same sparkling high standard. Nostalgic songs, happy songs, sad songs—all sorts of songs about the "riverboat days," and they make mighty pleasant listening indeed. The arrangements are bright and the backing smooth.

The tracks are titled: This Ol' Riverboat — Cottonblossom No. 1 — Riverboat Days — Banks of the Tennessee — Mark Twain (On The Mississippi) — Ol' Bailey — Same Old Huckleberry Finn — Down The Ohio — The Great Sultana — Kentucky Lullabye — Mighty Mississippi — Were You There?

The recording is excellent, with negligible noise and distortion and widely spread stereo sound.

Highly recommended, especially to those who enjoyed the B.P.M.'s first disc. A real winner! (J.R.)

★ ★ ★

THIS LAND IS YOUR LAND—The Mormon Tabernacle Choir, directed by Richard P. Condie, with the Philadelphia Orchestra conducted by Eugene Ormandy. C.B.S. Masterworks 12-inch stereo, SBR-235141. (Also in mono on BR-235141.)

Interest: American folk favourites.
Performance: Thoroughly enjoyable.
Recording: Excellent.
Stereo: Widespread, smooth.

The 375-strong Mormon Tabernacle Choir is featured on this disc together with the Philadelphia Orchestra conducted by Richard P. Condie and Eugene Ormandy, singing best-loved American folk songs. They sing with tremendous enthusiasm, and yet with complete precision; the effect is at times quite moving, and everywhere thoroughly enjoyable.

The tracks are titled: This Land Is Your Land — Down In The Valley — She'll Be Coming 'Round The Mountain—Beautiful Dreamer—Sweet Betsy From Pike — Gospel Train — Old Time Religion — When I First Came To This Land — Shenandoah — Home On The Range — He's Got The Whole World In His Hands — I Wonder, As I Wander — Oh Susanna — Deep River.

The recording quality is excellent, and the stereo the same. For choir lovers, a most enjoyable recording. (J.R.)

★ ★ ★

A SINGLE GIRL. Tina Date (vocal and guitar) with Edgar McGregor (guitar and Balalaika), Francis Lehmann (flute and recorder) "Dynamite" Finkelstein (banjo), Herbie Marks (virginals and tambourine, Ed Gaston (bass). RCA, stereo SL 101676. Also available in mono, L101676.

Interest: Australian folk singer.
Performance: Outstanding.
Quality: Excellent.
Stereo: Effective spread.

Tina Date has one advantage not possessed by many folk singers; and that is a sound musical education. (She was a student at the Sydney Conservatorium of Music.) As a result, she is not only a

If you want

STEREO EQUIPMENT

You'll deal better with

H. B. RADIO SALES

Cabinets for equipment and speakers at FACTORY PRICES are available from stock or we'll make to your order.
You will find our value terrific on Amplifiers—Stereo, radio chassis—players—speakers—tape decks.

APRIL SPECIALS

Trio STEREO AMPLIFIER, 20 watt R.M.S. $110. Linmark stereo amplifier 8 watts and two 8 W.R. speakers $54.50 also available Pioneer SMB161, SM83, SMQ300, Star, SA30, Roland.

NEW D.P. SLIMLINE enclosure to suit 10in and 12in speakers, 26 x 18 x 7¼ $18.50
Cabinet Kit only $10.50

MAGNAVOX or ROLA design slimline cabinet with 8 WR (VC 15, 8 or 3 ohms) or 8 CMX speaker fitted $25.25
Cabinet Kit only, ...$10.50

Record Players available: Dual —Garrard — Labcraft. Player Platforms: Maple finish $7. Teak finish $7.50. Perspex Cover: $9.00.

GOODMANS design 3 CF cabinet with tunnel, and Twin-axiom 10 speaker, ¾in material. $54
Cabinet Kit only $17

WHARFEDALE design 3 CF cabinet (R3) and Golden 10 speaker, ¾in material $59.00
Cabinet Kit only $17

Available in Maple, Walnut or Rosewood colours. Teak veneer. 10/ extra except last two which are 30/ extra.

PLAYMASTER Bookshelf Speaker System, Complete, $30.

Cabinet kit only $7.

All other parts including speakers, inner bond, etc., $15.50.

Postage N.S.W. $1.00; Qld., Vic., Tas. $1.40; other States $2.00

Write for Stereo Catalogue

H. B. RADIO SALES

Manufacturers of Quality Radio and Radio Furniture for 36 years.

103-105 Catherine Street,
LEICHHARDT, SYDNEY.
Telephone: 56-5580

CLASSIC TAPE RECORDERS

SALES AND SERVICE **93B LIVERPOOL ROAD, SUMMER HILL, N.S.W.**

Telephone 79-2618

NEW RELEASE!

FULLY TRANSISTORISED, light weight, hi fidelity tape recorder, using 14 SILICON TRANSISTORS for extreme performance and reliability (max. operating temperatures of silicon output transistors 200 deg. C.) TRANSFORMERLESS PUSH PULL output stage giving 5W (rms) OUTPUT (10w peak). Distortion less than .25%

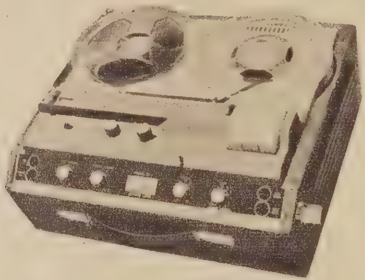
This is more than twice the output of most tape recorders available at present. Ideal for use as a Hi-Fi AMPLIFIER. Ready to connect to any record player. Record changers in portable matching carrying cases available.

MODEL TR 9

2 Track £74/10/- **4 Track £78/10/-**

Price includes dynamic Mic, Tape and Spool

- 3 speeds.
- Response 35-18,000 c.p.s.
- Separate treble and bass.
- Push-button operation.
- Wow .15%.



- 7in spools.
- Beautifully styled timber cabinet.
- Meter level indicator.
- Position for 3rd head.
- Monitoring through speakers.

Definitely superior in every respect to any other recorder under £100. Model TR9 special fitted with 3rd head—sound-on-sound—Dual track operation—high level stereo—sound with sound—Monitor tape or signal—Echo—Mixing £18 extra. Recording tapes at reduced prices, 7in 1200ft. £1/10/.

ASK FOR PAMPHLETS

LOOK AT THESE . . . SPECIAL OFFERS FOR APRIL — UNBEATABLE VALUE

ARMSTRONG 221. Integrated Stereo Amplifier (illustrated above).

The 221 Amplifier is designed for use primarily with magnetic pickups but inputs are also provided for the higher output ceramic and crystal pickups.

At its price the 221 represents a major breakthrough in high fidelity amplifiers. Never before has an amplifier of this quality, sensitivity and power, incorporating all these facilities, been available in this price range.

1 Armstrong 221 illustrated above. Integrated stereo amplifier with magnetic pick-up inputs. Dual 1009 with B and O diamond magnetic cartridge. 2 Wharfedale 8in. super RS/DD speakers . . . £137 **$274**

2 Armstrong 222 integrated stereo amplifier. Power output 10 watts, push-pull frequency response—30-20,000 c.p.s. 1dB. Power output 35-20-000 c.p.s 1db. Harmonic distortion less than 0.5 per cent at 1K/c measured at 8 watts output 1dB. Decca Deram diamond needle, 2 Goodmans 8in twinexiette speakers or 2 Wharfedale 8in RS/DD speakers. Garrard AT6 turntable £109 **$218**

3 Armstrong 226 tuner amplifier, FM broadcast, 12 watts per channel. World's best stereo equipment. Famous German made P.E. 34 Hi-Fi turntable with belt-driven hydraulically controlled built-in lowering device, incorporating diamond magnetic cartridge. 2 Goodmans twinexiette speakers £180 **$360**

4 Leak stereo 30 fully transistorised stereo amplifier. 2 Heco speakers systems consisting of bass speaker and tweeters in beautifully designed German cabinets. **Complete** £173 **$346**

5 Orpheus Silex transcription turntable. Empire 888 cartridge. Ortofon SMG 212 arm. **Complete** £57/10/- **$115**

6 Sansui SM34 amplifier and 2 Goodmans Mixim speakers. **Complete** £150 **$300**

7 Pioneer 204B amplifier. Dual 1010 turntable. Empire 888 cartridge and 2 Goodmans 10in twinexiette speakers £124 **$248**

8 New Garrard Lab. 80 turntable with Empire 888P cartridge. **Total** £53 **$106**

9 Truvox stereo transistor amplifier. Wharfedale super 8-inch RS/DD speakers. Dual 1009 turntable. Empire 888 cartridge £183 **$366**

10 Grundig full stereo tape recorder. One of the finest tape recorders in the world. Made in Germany. Armstrong 221 amplifier. PE34 turntable with Empire 888 cartridge. 2 Wharfedale Golden 10in RS/DD speakers. **Total** £242 **$484**

IF YOU REQUIRE ANY OTHER COMBINATION NOT LISTED—PLEASE WRITE.

We will care-pack and freight anywhere. If the goods you require are not listed write for our prices—you'll be delighted! R.M.S. are famous for selling the best quality equipment, and indisputably the cheapest in Australia.

RECORDED MUSIC SALON

C. PINCZEWSKI *TRUE FIDELITY*

23 COLLINS STREET
MELBOURNE
Telephone: 63-6257

WHOLESALE AND TRADE ENQUIRIES WELCOME

very good folk singer with excellent delivery, but she also has a fine sense of timing. Assisted by a group of competent musicians who provide sparkling and sometimes unusual accompaniments, she has given us what I regard as one of the outstanding folk song recordings to be made locally. It is a disc which should satisfy even the most discriminating connoisseur of folk singing.

Despite the many excellent points of this disc, however, I fear the emphasis on sex in the songs chosen by Miss Date may be offensive to some, though "broadminded" listeners will find little to complain about. The sound quality is first class, well worthy of an "excellent" rating, and the stereo spread is effective. Even the sleeve note is informative, with commendable lack of blurb.

The songs presented cover a wide variety of styles, ranging from "It fell upon a Summer's Day" by Elizabethan composer Thomas Campion to contemporary efforts by Bob Dylan and Queenslander Bill Scott. The full list of titles is: The Spinning Wheel — It's Hard on a Lass to be Lonely — L'Ariette — The Old Maid's Song — Polly Garter's Song — A Single Girl — Raggle Taggle Gypsies — The First Time Ever — The Butcher Boy — How Should I My True Love Know — Tomorrow is St. Valentine's Day — It Fell upon a Summer's Day — Tomorrow is a Long Time. (H.A.T.)

* * *

THROUGH THE YEARS, Nelson Eddy. Mono, RCA Gold Standard Series 45EP, 20,352.

Interest: One-time star.
Performance: A real singer.
Quality: Acceptable.

All the numbers on this 45EP are old chestnuts — and these classic performances by Nelson Eddy are one of the reasons why they are so: Through The Years — Love's Old Sweet Song — O Perfect Day — Trees.

If you're old enough to remember the original 78s, this re-issue will certainly allow you to re-live the experience. The accompaniments have that remote, dated sound but the quality is quite acceptable and probably better than what came off the original shellac pressings. (W.N.W.)

* * *

THE MILLS BROTHERS SING, Vol. II, produced by Randy Wood. Mono, Dot (Festival) ZL-31,800.

Interest: Popular vocal group.
Performance: Fair.
Quality: Good.

As one who has not specially listened for some time to the music presented by the Mills Brothers I was rather disappointed by their performance on this disc. While at times, during any particular item, the harmonising is excellent, there are ragged spots elsewhere and only one track left me completely satisfied with the total performance. This was their rendition of "I Wish I Knew the Name of the Girl In My Dreams."

Other titles presented are: Sleepy Time Gal — Bye Bye Blackbird — Tennessee Waltz — The Loveliest Night Of The Year — Dinah — You Can't Fool A Broken Heart — Linda — Goodnight, Irene — A Thousand Stars — There's No Tomorrow — I Wish.

The theme of the tracks is predominantly a romantic one and the rendition intended is sweet and mellow. The recording quality is good and the album should appeal to Mills Brothers fans, despite my personal reservations. (K.W.)

* * *

MY NAME IS BARBRA, TWO . . . Barbra Streisand. CBS 12-inch stereo. SBP 233281.

Interest: Popular singer.
Performance: Enchanting.
Recording: Excellent.
Stereo: Smooth, widespread.

Sultry and seductive one moment, captivatingly innocent the next, Barbra Streisand is a most versatile and enchanting personality. Her immensely popular "Emmy" award winning TV show "My Name Is Barbra" seen here recently reveals her not only as a most talented and controlled singer, but also as an all-round entertainer with an infectious joie de vivre and the rare gift of intimate projection.

On this disc CBS have captured most of the sound track of the TV show, and fine entertainment it makes. Miss Streisand's warm and smooth voice carries one through from track to track, scarcely missing the video, and the disc is over all too soon. A really sparkling performance.

The songs on the disc are: He Touched Me — The Shadow Of A Smile — Quiet Night — I Got Plenty Of Nothin' — How Much Of The Dream Comes True — Second Hand Rose — The Kind Of Man a Woman Needs — All That I Want — Where's That Rainbow — No More Songs For Me — Medley: Second Hand Rose — Give Me The Simple Life — I Got Plenty Of Nothin' — Brother Can You Spare A Dime — Nobody Knows You When You're Down And Out — Second Hand Rose — The Best Things In Life Are Free. (The repeated titles are not errors, but appear this way on the disc.)

The recording is the equal of the performance: Excellent. And the stereo is smooth and widely spread.

In all respects, then, a real winner! (J.R.)

* * *

SONGS JACK SPEERING LIKES TO SING, featuring Norman Traise at the piano. Mono Festival FL-31,835.

Interest: Old-time Favourites.
Performance: Mediocre.
Quality: Good.

The music presented in this album is strict dance time tempo and as such may prove to be suitable for small dance parties. The old-time favourites would also have some merit for a sing-along interlude. But the unvarying sound of Jack Speering's voice, its limited range and lack of expression does not encourage one to sit back and listen to the disc for any musical pleasure it might give.

On the credit side one must describe the accompaniment as quite passable, although faithfully following conventional dance-hall style. In all, 27 melodies are presented on this disc, too numerous to list in detail. A few of the titles are: Underneath the Arches — Pretty Baby — Carolina in the Morning — Oh, You Beautiful Doll — Lily of Laguna — Did Your Mother Come From Ireland.

While no particular track could be described as outstanding, two which I found better than average were "South of the Border" and "Dad's Birthday Waltz." (K.W.)

New stocks just arrived!

To meet continued demand we've landed another shipment of the latest

ROGERS
CADET
MARK THREE

Stereo Amplifier and Control Unit

*

Latest development of the highly successful earlier models, this new Rogers Cadet Mark Three features:—

* ONLY 0.25% DISTORTION.
* 10 watts per channel.
* 20 — 20,000 C.P.S. ± 0.5DB.
* Inputs: 2M/V for magnetic pick-ups.
* Pick-up matching by Adaptors.
* Tape panel socket.
* Filters — Hi & Low Pass.
* Plus many more refinements.

ONLY LOW DISTORTION INDICATES TRUE *HIGH FIDELITY

—and Cadet Mark III gives the LOW distortion that has always typified this BRITISH MADE Rogers equipment.

URD

Full technical information & illustrations on request.

UNITED RADIO
DISTRIBUTORS PTY. LTD.
175 Phillip Street, Sydney
Telephones: 28.3718, 28.3926
OPEN SATURDAY MORNINGS
Sydney's leading High-Fidelity Specialists

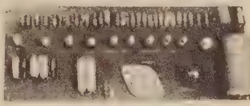
HAM RADIO SUPPLIERS

5A MELVILLE STREET, HAWTHORN, VICTORIA

Phone 86-6465 **ESTABLISHED 1947**

SINCLAIR X-20

INTEGRATED 20 WATT PULSE WIDTH MODULATED AMPLIFIER AND PRE-AMP



A new concept in high fidelity performance

The use of P.W.M. assures a far better transient response than is possible with other amplifiers and this adds greatly to the quality of reproduction from the speaker.

Harmonic distortion is so low as to be hardly measurable, let alone audible, and cross-over distortion, which can cause such marked unpleasant effects in conventional transistor amplifiers, simply cannot occur at all in the X-20.

Number of transistors:	12
Overall size:	8¼in x 3¼in x1in.
Weight:	4½oz.
Input sensitivity:	1mV into 5kΩ.
Total harmonic distortion:	Less than 0.1% at 10 W.

Output power into 7.5 or 8 ohm speaker:
20 watts R.M.S. music power.
15 watts R.M.S. continuous.

Output power into 15 ohm speaker:
15 watts R.M.S. music power.
12 watts R.M.S. continuous.

These output ratings are quoted to the standard British method of rating. Using the method usually employed in the U.S.A., these ratings would be doubled, giving, for example, 40 watts music power into a 7.5 ohm speaker.

Frequency response, at all power levels:	20 c/s to 20 kc/s plus 1 db
Damping factor:	Greater than 100.
Quiescent consumption:	About 150 mA.
Supply voltage:	28 to 37 volts (7.5Ω speaker). 28 to 45 volts (15Ω speaker).
Signal to noise ratio:	Better than 70 dB.
Pulse repetition frequency:	65 to 75 kc/s.

Enegy conversion factor at output at least 95% efficient.

A filter is built into the output of the X-20 so that it may be used with any type of resistive or inductive load of the correct impedance.

X-20 AMPLIFIER

Completely Built and Tested.

Price £16/15/- $33.50

SINCLAIR X-20 AMPLIFIER

Complete Kit of Parts
with instructions for assembly.

Price £13/7/6. $26.75 inc. tax

X-20 A.C. MAINS POWER

Supply (200-240 volts).
Suitable for driving up to
2 x 20 Units.

Price £7/17/6. $15.75 inc. tax

12-VOLT TRANSISTORISED POWER SUPPLY

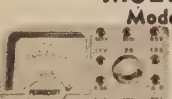
Q Plus type TPS50/12.
INPUT: 12 volts DC.
OUTPUT: 300 and 150 volt DC 50 watts continuous operation.
FREQ.: 1200 c/s approx.
As-new condition.

Price £11/10/-. $23.00

Post extra.

FERROCART POCKET MULTIMETER

Model PT34



300 uA movement.
AC and DC voltages: 0-10, 0-50, 0-250, 0-500, 0-1,000c.
Current ranges (mA) 0-1, 0-100, 0-500 mA.
Ohms range: 0-100,000
Size 3¾ x 2½ x 1¼ inches.

Price 57/6. $5.75

Complete with leads.

TV BALLUN

ABL 300 Ohm TV Ballun $1.75 (17/6)

TRANSISTORS AND DIODES

AC125	9/6	95c
AC126	9/6	95c
AC127	10/6	$1.05
AC128	10/	$1.00
AF114N/ OC171	10/	$1.00
AF115N/ OC170	10/	$1.00
AF116N	9/6	95c
AF117N	9/6	95c
AF118	22/	$2.20
BC107	11/	$1.10
BC108	10/	$1.00
BC109	14/	$1.40
OC26	26/	$2.60
OC35/ AT1138A	35/	$3.50
OC44N	11/	$1.10
OC45N	11/	$1.10
OC70	12/	$1.20
OC71/2N215	7/6 (or 3 for £1)	75c (or 3 for $2)
OC72	13/6	$1.35
OC74N	9/6	95c
OC75	13/6	$1.35
OC169	19/6	$1.95
OC170/ AF115N	10/	$1.00
OC171/ AF114N	10/	$1.00
2N217	9/6	95c
2N270	13/6	$1.35
2N370	19/	$1.90
2N372	19/	$1.90
BY100/ OA214	16/	$1.60
OA79	4/	40c
OA80	3/	30c
OA81	3/	30c
OA90	3/3	32c
OA91	3/3	32c
OA95	3/3	32c
OA200	7/6	75c
OA210, 1N1763, 1N3194, HR25	8/6	85c
OA211, S10AR2	16/	$1.60
1N3491 40 piv 18 amp	9/6	95c

ZENER DIODES

OAZ200	15/6	$1.55
OAZ212	12/6	$1.25
OAZ213	12/6	$1.25
OAZ222/ BZZ14	27/6	$2.75
OAZ224/ BZZ16	27/6	$2.75

LAFAYETTE TE-22 AUDIO GENERATOR

Specifications:
Sine Wave Range: 20 cps to 200K cps in 4 bands.
Square Wave Range: 60 cps to 30K cps.
Frequency Response: Plus-minus 1.5 db, 60 cps to 150 K cps.
Output Voltage: Load impedence 1 M ohm 7 volt (max.). Load impedence 10 K ohm 5 volt (max.).

PRICE: £22/2/6. $44.25.

Kyoritsu
STANDING WAVE RATIO
FORWARD
REFLECTED
SENSITIVITY
SELECTOR

SWR METERS Model KSW-10

SPECIFICATIONS:
Standing Wave Ratio: 1:1 to 1:10.
Accuracies: plus or minus 3% scale length.
Impedance: 52 ohms and 75 ohms.
Meter: 0-100 DC microamperes.

PRICE £9/10/- $19 inc. Tax.

CRYSTALS

Crystals in FT243 Holders. As New EX SCR536/ BC611 Walkie-Talkies.

4080 Kc.
4397 Kc.
4495 Kc.
4676 Kc.
4695 Kc.
4735 Kc.
4815 Kc.
4840 Kc.
4852 Kc.
4950 Kc.
5205 Kc.
5295 Kc.
5327 Kc.
5360 Kc.
5385 Kc.
5397 Kc.
5660 Kc.
5780 Kc.
5852.5 Kc.
5920 Kc.
6235 Kc.
6375 Kc.

7/6 each or 3 for £1
75c each or 3 for $2.00

CRYSTALS in DC 11 HOLDERS

5980 Kc.	12/6	$1.25
6420 Kc.	12/6	$1.25
5980 Kc.	12/6	$1.25

CITIZENS BAND CRYSTALS

Miniature HC6/U ½" pin spacing
27.240 Megacycle 27/6 each.
26.785 Megacycle 27/6 each.
HC6/U Crystal Sockets 2/9
FT243 Crystal Sockets 2/9

CLIENTS NOTE, THE ABOVE FREQUENCIES ONLY AVAILABLE AT THE MOMENT.

ELECTROLYTIC CAPACITORS

Brand new Sub-miniature & Pigtail, PVC sleeved

Mfd.	Volts	Price	Mfd.	Volts	Price
2	12	30c (3/)	30	12	32c (3/3)
4	3	30c (3/)	30	6	30c (3/)
5	6	30c (3/)	32	350	50c (5/)
5	12	30c (3/)	50	6	30c (3/)
5	18	35c (3/6)	50	12	35c (3/6)
8	10	30c (3/)	50	25	45c (4/6)
8	15	30c (3/)	64	6	32v (3/3)
8	300	48c (4/9)	64	18	32c (3/3)
8	600p	58c (5/9)	100	6	32c (3/3)
10	3	30c (3/)	100	12	37c (3/8)
10	6	30c (3/)	100	25	50c (5/)
10	12	30c (3/)	100	350	$1.50 (15/)
10	25	32c (3/3)	250	3	50c (5/)
16	10	32c (3/3)	250	16	50c (5/3)
16	300	52c (5/3)	250	50	90c (9/)
15	600p	70c (7/)	500	12	50c (5/)
24	350	70c (7/)	500	50	$1.30 (13/)
24	500	75c (7/6)	1000	6	82c (8/3)
25	3	30c (3/)	1000	12	98c (9/9)
25	6	32c (3/3)	1000	18	$1.15 (11/6)
25	12	30c (3/)	1000	25	$1.32 (13/3)
25	25	35c (3/6)	50plus50	350	$1.60(16/)
25	50	42c (4/3)	(can type)		

VERNIER DIALS

Ratio 8 to 1, reduction, scaled 0-10.

Type T501, 1½in diam.	$1.75 (17/6)
Type T502, 2in diam.	$2.20 (22/)
Type T503, 3in diam.	$2.80 (28/)

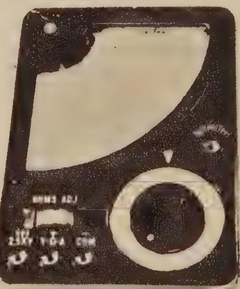
TRANSISTOR INTERCOM UNITS

4 Station: 1 master 3 sub-stations 3 Transistor, 250mW, Amplifier, Battery operated (Eveready 216), complete with Battery, Wire, Staples and fitting instructions $20.50 (£10/5/)
Also 2 Station Model $13 (£6/10/)

THREE-STATION INTERCOMS as per above photo—one master station and two sub-stations. £8/7/6 ($16.75)

MULTIMETER Model 200H

20,000 ohms per v. d.c. 10,000 ohms per v. a.c.



Specifications:
DC volts: 0-5, 25, 50, 250, 500, 2,500.
AC volts: 0-10, 50, 100, 500, 1,000.
DC current: 0-50 uA.; 25, 250 mA.
Resistance: 0-60 K ohms; 0-6 meg.
Capacity: 0.01-0.3 uF; (at AC 5v); 0.0001 - 0.01 uF. (at AC 250v).
Decibel: Minus 20 db plus 22 db.
Output range: 0-10, 50, 100, 500, 1,000.
Battery used: UM3 1.5s, 1-piece. Dimensions: 3¼ x 4½ x 1⅛in.

Price £5/12/6 $11.25 inc. tax.

Complete with internal battery, testing-leads and prods.

TAXI RADIOS

Pye MK1 Reporter Transceivers Ex-Taxi. Approx. 70-80 M/C AM Crystal Locked, complete with valves less crystal, ideal for conversion to AM Net 52 M/C. GOOD CONDITION $30 (£15)

ALIGNMENT TOOLS

Jabel No. 4 Alignment Tool Kits. All popular sizes, 4 Tools in Plastic Pouch .. $1.20 (12/)

GRID DIP OSCILLATORS

Lafayette TE-18 G.D.O. 8 Bands, Plug in Coils, 360 Kc-220 M/C, 240 volt £19/15/-

HAM RADIO SUPPLIERS

5A MELVILLE STREET, HAWTHORN, VICTORIA

Phone 86-6465 **ESTABLISHED 1947**

SINCLAIR Z-12 INTEGRATED HIGH FIDELITY PRE-AMPLIFIER AND 12 WATT AMPLIFIER

PRICE £9/15/ ($19.50)
inc. tax

POWER SUPPLY for Z-12: 6, 9, 12, 15 volts at 1 amp,
PRICE £7/17/6 ($15.75)
inc. tax

SPECIFICATIONS:
No. of transistors: 8.
Overall size: 3in. x 1.8in. x 1.3in.
Weight: 3oz.
Output power into 3 ohm load:
5 watts RMS continuous with 12-volt supply.
8 watts RMS continuous with 15-volt supply.
13 watts RMS continuous with 18-volt supply.
Output power into 1.5 ohm load:
10 watts RMS continuous with 12-volt supply.
16 watts music power with 15V. supply.
Power response: 1.5dB below 1KC at 20KC and 65 cps.
Frequency response: 15 c/s to 50KC plus or minus 1dB.
Input sensitivity: 2mV into 2Kohm.
Quiescent consumption: 12-volt supply—15mA.
Signal to noise ratio: Better than 60mA.
Total distortion: Less than one per cent.

SPEAKER BOXES

Plastic Speaker Box with 4in speaker and wire	55/	$5.50
Wooden Speaker Box with 6 x 4in speaker and wire	65/	$6.50

CHASSIS PUNCH SET

Hozan K-83 sizes 16, 18, 21, 25 and 30 mm, complete with taper reamer in wooden storage box	70/	$7.00

TRANSISTOR RADIO PARTS

To suit Zodiac, Grays, Tele-tone, Chevron, Lincoln, Retravision, Home Star and Vista (6 transistor radios).

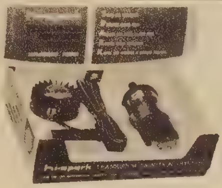
Speaker 8 ohms 2¼in diam.	22/6	$2.25
Power capacity 200 mil watts. Gang with knob Capacity—Aerial section 6 to 142 PF Oscillator 6 to 60 PF	20/	$2.00
Aerial Coil on Rod	7/6	75c
Output transformer, 480 ohms to 8 ohms	15/	$1.50
Interstage transformer, 8000 ohms to 3000 ohms	12/6	$1.25
Oscillator Coil, 360 micro henry	8/6	85c
Potentiometer switched with knob, 5000 ohms	8/6	85c
6 Transistors and 1 Diode, 2-2N408/OC74N, 3-2N410/OC45, 1-2N406/OC71, 1-OA90	82/6	$8.25
3-IF Transformers, 455 K/C	30/	$3.00
Complete set resistors and condensers (32)	42/6	$4.25
Printed Circuit Board	10/	$1.00
Cabinet complete with earphone Jack, earphone and carrying cases	25/	$2.50

COAXIAL CONNECTORS—AMERICAN TYPE

PL259 Coaxial Plug	9/6	95c
4087-1 Coaxial Plug (PL259, PTFE)	14/6	$1.45
S0239 Coaxial Socket (suit PL259)	9/	90c
4802-1 Coaxial Socket (PTFE)	14/8	$1.47
C32-14 Coaxial Dble ended female cable joiner (PTFE)	17/6	$1.75
UG175U Adaptor for PLT59 to suit ¼in cable	2/9	28c
C32-17 Coaxial "T" Piece. Suit P1259	23/3	$2.32
BNC SERIES:		
UG88 CU Coaxial Plug (PTFE)	15/9	$1.58
UG290/U Coaxial Socket (PTFE)	12/6	$1.25
BELLING LEE TYPE:		
Coaxial Plug (suit ¼in cable	4/	40c
Coaxial Socket	3/6	35c
Coaxial Socket (flush mount)	3/6	35c
Coaxial Cable joiner (female)	4/	40c

PARTS FOR RTV & H TACHO

Meter (MR3P) 0-1 m/a	50/	$5.00
7000 or 5000 r.p.m. scale, extra	15/	$1.50
Henry choke ready wound	22/6	$2.25
I.K. trimmer pot	4/	40c
Circuit board	6/	60c



"HI-SPARK" TRANSISTOR IGNITION SYSTEM

12TN 12Volt negative earth Inc. Tax.	£16/10/	$33.00
6TN 6Volt negative earth Inc. Tax.	£16/10/	$33.00
12TP 12Volt positive earth Inc. Tax.	£20/10/	$41.00

Complete replacement system, contains transistor unit, special ignition coil, ballast resistor, wire, and installation hardware.

VARIABLE CONDENSERS EDDYSTONE (CERAMIC) ¼" SHAFT

580 Condenser	13.5 pf	22/6	$2.25
582 Condenser	63 pf	25/	$2.50
584 Butterfly Cond.	32x32 pf	25/	$2.50
585 Condenser	91 pf	27/6	$2.75
586 Condenser	140 pf	38/6	$3.85
817 Transmitting Cond.	270 pf	52/6	$5.25

ROBLAN BROADCAST GANGS

RMG1 Single Gang,	10-50 pf	18/6	$1.85
RMG1 Single Gang	10-415 pf	18/6	$1.85
RM92 2 Gang	10-415 pf	25/	$2.50
RMG3 3 Gang	10-415 pf	33/6	$3.35

ROTARY SWITCHES (JABEL)

3 pole 3 position	10/	$1.00
4 pole 3 position	10/	$1.00
2 pole 6 position	10/	$1.00
1 pole 12 position	10/	$1.00

BATTERY CHARGERS DUAL

COMPLETE WITH METER IN METAL HAMMERTONE CASE

6 volt 4 amp ($15.75) 12 volt 6 amp ($21.75)
12 volt 4 amp ($15.75) 6 volt 6 amp ($21.75)

RECORDING TAPES WELL KNOWN MAKES BRAND NEW IN CARTONS

150 ft on 3 inch reel Acetate	6/	60c
225 ft on 3 inch reel Acetate	7/6	75c
300 ft on 3 inch reel Tensilised Mylar	12/6	$1.25
500 ft on 3 inch reel Tensilised Mylar	16/6	$1.25
600 ft on 3¼ inch reel Tensilised Mylar	16/6	$1.65
600 ft on 5 inch reel Acetate	17/6	$1.75
900 ft on 5 inch reel Acetate	19/6	$1.95
900 ft on 5 inch reel Mylar	22/6	$2.25
1200 ft on 5 inch reel Mylar	35/	$3.50
1800 ft on 5 inch reel Tensilised Mylar	52/6	$5.25
850 ft on 5¾ inch reel Acetate	17/6	$1.75
1200 ft on 5¾ inch reel Mylar	35/	$3.50
1800 ft on 5¾ inch reel Tensilised Mylar	52/6	$5.25
2400 ft on 5¾ inch reel Tensilised Mylar	70/	$7.00
1200 ft on 7 inch reel Acetate	27/6	$2.75
1200 ft on 7 inch reel Mylar	32/6	$3.25
1800 ft on 7 inch Acetate	37/6	$3.75
1800 ft on 7 inch reel Mylar	45/	$4.50
2400 ft on 7 inch reel Mylar	52/6	$5.25
3000 ft on 7 inch reel Tensilised Mylar	75/	$7.50
3600 ft on 7 inch reel Tensilised Mylar	92/6	$9.25

EMPTY TAPE REELS

3 inch	2/6	25c
3¼ in	3/6	35c
4 inch	3/6	35c
5 inch	4/	40c
5¾ inch	5/6	55c
7 inch	5/	50c
OR IN PLASTIC STORAGE BOX		
5 inch	8/	80c
7 inch	12/	$1.20

TRANSISTOR SIGNAL INJECTOR

Pencil type 2 transistor, complete with instructions and battery	55/	$5.50

POLYPAK SPECIALS

100 assorted new, resistors, condensers, potentiometers, popular types	17/6	$1.75
100 new assorted paper, dielectric, metalpak, capacitors, popular types	15/	$.150
30 assorted new resistors, condensers, potentiometers, popular types	10/	$1.00
20 polyester, paper, ceramic, plastic and electrolytic condensers, popular types. New	10/	$1.00
20 polyester, styroseal capacitors. All new popular types	10/	$1.00

BEZALS AND NEON INDICATORS

Sato 3280 6-8 volt subminiature, red, green, blue	4/6	45c
NEZ Neon indicator 65 volt flying leads	3/	30c
230 volt red Neon bezal	6/6	65c

POWER TRANSFORMERS

1992 150V-0-150V 30 M/A 6.3V-1.75A	37/6	$3.75
1993 225V-0-225V 50 M/A 6.3V-2 amp	45/	$4.50
2062 Voltage doubler 290,265V. D.C. 80 M/A Primary 6.3 Volt C.T. 2.25A Secondary	67/6	$6.75
2064 Voltage Doubler 340,315V. D.C. 125 M/A Primary 6.3 Volt C.T. 2.25A Secondary	87/6	$8.75
2067 Voltage Doubler 310, 285, 260V. D.C. 100 M/A Secondary 6.3 Volt C.T. 4 amp Primary	83/6	$8.35
290V-0-290 Volt 60 mA, 6.3v 2A, 5v 2A	27/6	$2.75
385v-0-385 volt 100m A, 6.3v 3A, 5v, 2A	35/	$3.50
385v-0-385 volt 125mA, 6.3v 3A,6.3c 2A, 5v 2A	45/	$4.50

AUDIO TRANSFORMERS

2624 7000 ohm SE 500 ohm SE Primary 2, 3.7, 8, 15 ohm secondary	46/	$4.60
4013 15 watt 6600 ohm C.T. 20 p.c. primary 3.7, 8, 15 ohm secondary	164/8	$16.46
4020 10 watts primary 9000 ohm C.T. 20 p.c. Ultra Linear (Mullard 10-10) Secondary 3.7 or 15 ohm.		

TRANSISTOR TRANSFORMERS

TD1 Driver 3000 ohm-2000 ohm C.T.	19/6	$1.95
TD2 Driver 420 ohm C.T.-105 ohm C.T.	19/6	$1.95
TO1 output 375 ohm C.T.-3.5 ohm 500 MW	16/	$1.60
TO2 Output 97 ohm C.T.-3.5 ohm 1 watt	18/6	$1.85
TO4 Output 300 ohm C.T.-3.5 ohm 5 watt	37/6	$3.75

FILAMENT TRANSFORMERS

T 4/4 230V-6.3V 2 amp	32/6	$3.25
2150 240V-6.3V-2.5 A or 2 x 6.3-1.25A	35/	$3.50
2155 240V-6.3V, 7.5, 8.5, 9.5, 12.5, 15V lamp	46/	$4.60
12/64 240V 6 volt 4 amp-12 volt, 4 amp	50/	$5.00
12/66 240V 6 volt 6 amp-12 volt, 6 amp	57/6	$5.75
Power filter choke. Special 14 Henry 60 M/A 12/6 to clear		$1.25

SPEAKERS—WELL KNOWN

MAKE, BRAND NEW, BANKRUPT STOCK

2in	15ohm	30/	$3.00
3in	15-3.5	32/6	$3.25
4in	15-3.5	37/6	$3.75
5in	15-3.5	40/	$4.00
6in	15-3.5	45/	$4.50
5in x 7in	15-3.5	47/6	$4.75
8in	15-3.5	52/6	$5.25
9in x 6in	15-3.5	55/	$5.50
12in	15- or 3.5	82/6	$8.25

WIDE RANGE LOUDSPEAKERS

5in Twin Cone Tweeter 15 watts RMS (4000 cps to 16 K/c)	45/	$4.50
6in Twin Cone (60-16000 C/s) 5 watt, available in 8 or 16 ohms	50/	$5.00
8in Twin Cone (50-16000 C/s) 10 watt, available in 8 or 16 ohm	75/	$7.50
12in Twin Cone (45 C/s-10 K/c) 10 watt, available in 3.5 or 15 ohm	100/	$10.00
12in twin cone (30-13000 C/s) 20 watt, available in 8 or 16 ohm	195/	$19.50

TRADE REVIEWS AND RELEASES

Quality Audio Components . . .

Pictured are the Akai Model AA-5000 all-transistorised unit stereo amplifier, the "Micro" professional tone arm and the "Micro" M-1007 and SC-301 magnetic and ceramic stereo cartridges. These high-grade audio components from Japanese manufacturers were sent to our laboratory for review by the Australian agents, Magnecord Australasia.

As noted in these columns in the March issue, the AA-5000 represents the first entry into the high quality audio amplifier field by the well-known manufacturer of tape recorders, Akai Electric Co. Ltd. It is a fully silicon transistorised stereo pre-main or "unit" amplifier with a rated power output of 2 x 23W into 16 ohms (2 x 35W into 8 ohms), measuring only 17in x 5 3/8in x 10 5/8in.

Physically the amplifier is quite attractive, with a sturdy matt-finish aluminium extrusion front panel, silver-grey case and wooden ends having an oiled-teak finish. The control knobs are of the turned aluminium variety and give a professional appearance, although the lack of knurling on some of the knobs of the unit tested made operation a trifle less convenient than one could wish. A central ridge in the extruded front panel does not help in this regard either, tending to restrict the accessibility of the major control knobs.

SOLID STATE
BASS
TREBLE
BALANCE
BASS
TREBLE
STEREO HEAD PHONE
POWER
SPEAKER
MODE
VOLUME
LOUDNESS
LOW
HIGH
FILTER
SELECTOR

The usual continuously variable bass and treble controls are fitted, but with the added feature that they are separately provided for the two channels in contrast with the usual ganged controls. This allows exact balancing over the full tonal range (although it is probably a small minority of potential users whose ears are sensitive enough to even detect the imbalance errors in ganged controls, let alone be upset by them). The balance control proper is of the type which may be used to reduce either channel to silence at the extremes of rotation, if this is required.

Both "Mode" and "Selector" switches are provided, although for a reason which is not apparent one of the input signals ("Tape Monitor") is selected not by the selector but by the mode switch. In all, five stereo inputs are provided, catering for tape heads, tape recorders, magnetic pickups, radio tuners, and "Aux" (mixers, FM tuners, etc.). Four modes of operation are possible: stereo, stereo reverse, mono fed from the "L" input and mono fed from the "R" input.

In addition to the rotary controls there are five front-panel slider switches. These control power, speakers (a handy feature, allowing the speakers to be disconnected for stereo 'phone listening), loudness control, LF filter and HF filters respectively. A front-panel jack is provided for stereo 'phones.

The rear panel of the amplifier presents the five pairs of stereo inputs ("American phono" connectors), two output connectors for tape recording, a DIN connector for connection to tape recorders, an earth terminal, both terminals and jacks for speaker connections, and two mains outlet sockets. The case is well ventilated and the unit remains quite cool in operation.

Tested in our laboratory the AA-5000 easily met its published specifications. With 15-ohm loads it easily delivered more than 30W RMS per channel at 1KC before clipping occurred, and the T.H. distortion at the rated output of 23W was well below 0.5 per cent. With 8-ohm loads the output was greater than 35W RMS (per channel) with distortion still below 0.5 per cent. Frequency response was 3dB down at lower than 18cps and 40KC, for both channe
and maximum crosstalk was a low 46
at 20KC.

The bass controls give approximat
16dB boost and cut at 60cps, while t
treble controls allow approximately 12
boost or cut at 10KC. The loudness swit
is not a simple filter insertion, but conve
the gain control into a good approximati
of a standard loudness control. At full ga
the response is quite flat; at "10 o'cloc
approximately 8dB of boost is applied
100cps and 10KC.

The effect of the LF and HF filters w
be a little disappointing to those who e
pect fixed filters to provide a means
sharp-cutoff attenuation for rumble a
scratch filtering: the LF filter starts abo
1KC (-3dB at 600cps) and provides o
10dB of attenuation at 30cps, and the H
filter starts below 4KC (-3dB at 5KC) a
provides only 7-8dB attenuation at 10K
About their only purpose would be
quickly-selectable "half cut" tone contr

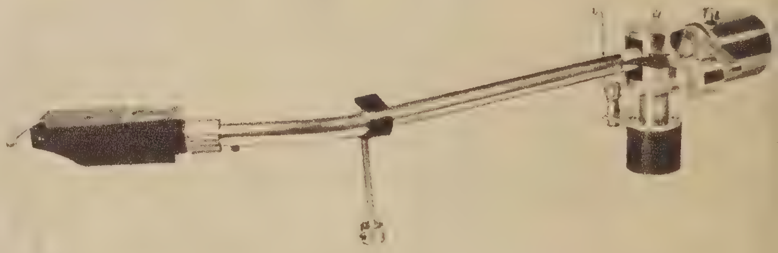
Input sensitivity of the AA-5000 virtua
as claimed, with 1.5-2mV required at t
tape head inputs, 3-4mV required at t
magnetic pickup inputs or 400mV requi
at the tuner, AUX, or tape monitor inp
for rated output at 1KC. Signal-to-noise
all inputs is quite acceptable.

It should be noted that the pickup in
channels are intended only for magne
cartridges and have an input impedance
approximately 100K. This is also the in
impedance of the tuner and "Aux"
puts. For use with crystal or ceramic ca
ridges a correction filter will have to
used between the cartridge and the pick
inputs.

The sample amplifier tested was a 10
117V model, but it would appear that 24
models will be made available shortly.

In all, then, the AA-5000 has shown its to be an excellent performer and a wor
choice for the music lover who requires
amplifier of somewhat higher power rat
than usual. Retail price of the unit
quoted as $298 (£149).

At left, the Akai AA-5000 fully transistorised stereo amplifier. The Micro MA-77 tone arm is shown below.

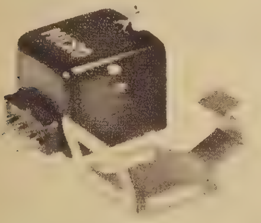


TONE ARM: The Micro MA-77 prof
sional tone arm is a 14-inch long unit fini
ed in polished metal. It is fitted w
gymbal-type bearings and is provided w
full adjustments for height, longitudinal a
lateral balancing. Playing force is adjusta
from 0 to 5gms by means of a mova
side weight which slides along a rod c
brated in 0.5gm increments.

A gauge is provided to allow the arm
be accurately set parallel to the turntable
ensure the correct vertical tracking an
An outward-directed groove bias cancel

force may be applied to the arm if so desired, by means of a hook-weight-graduated rod assembly supplied.

The bearings of the MA-77 are precision ball bearings, and result in an extremely low bearing friction. The arm itself is made from light but strong aluminium alloy, damped with rubber at appropriate spots to minimise resonanaces. It takes headshells of the standard E.I.A. type as fitted to S.M.E. and Ortofon arms, suitable for all cartridges having ½-in mounting hole spacing. Both arm base and rest mount to the motor board via single mounting holes.



The Micro M-1007 magnetic stereo cartridge, shown separated from its mounting clip. A good performer in the medium-price field.

Tested in our laboratory the MA-77 performed extremely well. It is easily assembled and set up using the instructions supplied, and is most convenient in use. At the moderate price of $45 (£22/10) it would seem excellent value for money in the high-grade tone arm category.

TWO CARTRIDGES: From the same manufacturer come the M-1007 magnetic cartridge and the SC-301 ceramic cartridge. The M-1007 appears to be of the moving magnet type and has a response subtantially flat from 20cps to 18KC (plus/minus 4dB). Although there is a small peak in output at 9-10KC this is well damped and is not disturbing.

Compliance is a respectable 4.5 micro-cM/Dyne, and the cartridge is designed to track at from 1.5 to 3gm playing force. Tested in the MA-77 arm it proved quite able to meet this specification.

Designed for a load impedance of 100K, the M-1007 has an output of 5mV at 1KC for a recorded velocity of 5cM/sec.—placing it in the medium-output category. Channel balance is held to within 1dB over most of the frequency range, with crosstalk at 1KC approximately −22dB. The cartridge is quite well shielded and is relatively insensitive to stray AC fields.

At the quoted retail price of $25 (£12/10/) it also represents good value for money.

The SC-301, a ceramic cartridge of more modest pretensions but quite capable of high-quality reproduction. It is available with either sapphire or diamond stylii.

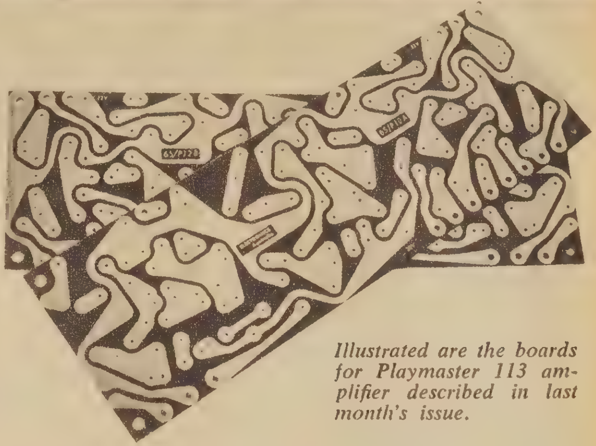
The SC-301 ceramic cartridge although more modest in conception is capable of very pleasing reproduction. When operated into loads of 2M or higher and used with a playing force of from 2 to 4gms it has a response o fapproximately 30cps—16KC.

Retail price of the SC-301 cartridge is quoted as $9.75 (£4/17/6).

Trade inquiries regarding Akai and Micro products should be directed to Magnecord Australasia Pty. Ltd., at 210 Clarence Street, Sydney. (J.R.)

MELBOURNE SUPPLIER FOR PRINTED BOARDS

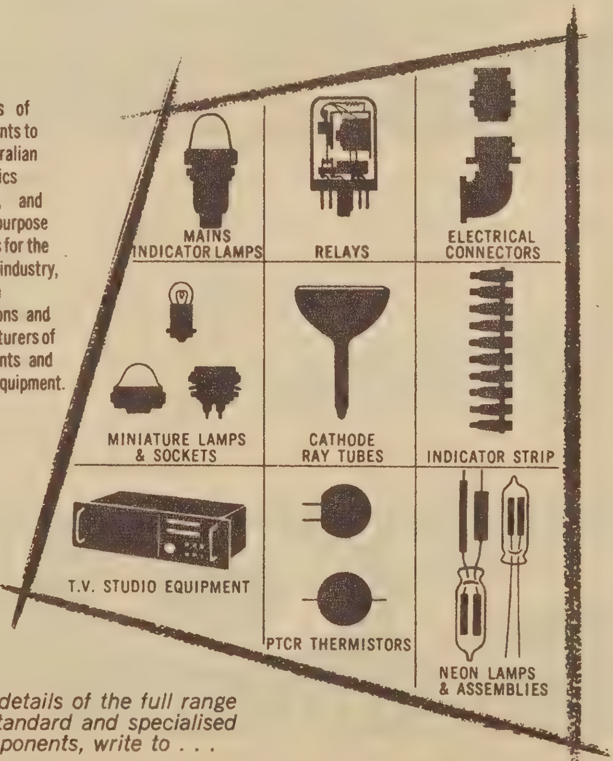
Printed wiring boards of excellent quality are available from Precision Windings, 52 Cambro Road, Clayton, Victoria. Standard "Electronics Australia" patterns will be stock items, and special boards be custom - made. Boards can be single or double-sided, on phenolic paper, epoxy or glass, with gold-plate if required.



Illustrated are the boards for Playmaster 113 amplifier described in last month's issue.

THORN
SPECIAL PRODUCTS

Suppliers of components to the Australian electronics industry, and special-purpose products for the aviation industry, research institutions and manufacturers of instruments and control equipment.

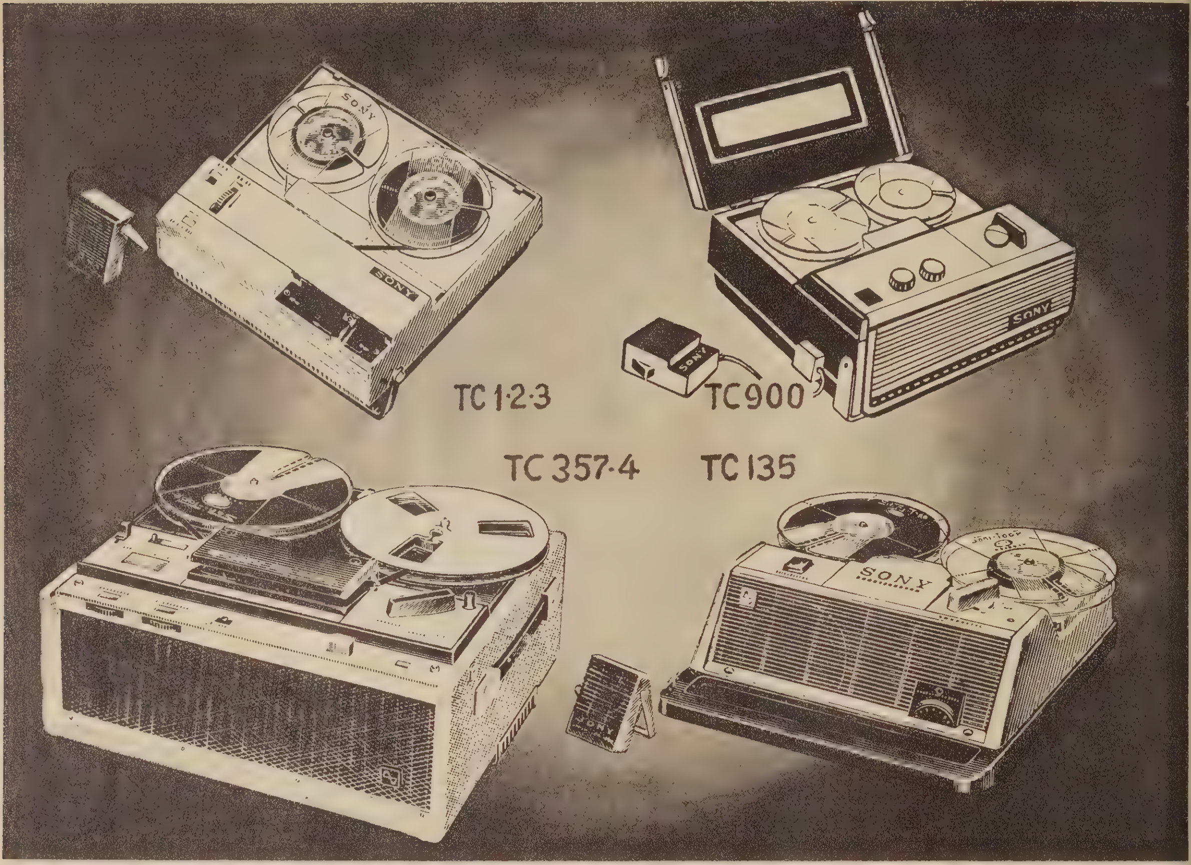


For details of the full range of standard and specialised components, write to . . .

TSP/1

THORN
SPECIAL PRODUCTS
THORN ELECTRICAL INDUSTRIES (AUST.) PTY. LTD.
HEAD OFFICE: 498 ALBION STREET, WEST BRUNSWICK, MELBOURNE.
Telephone 36 5313. Branch offices at Sydney, Adelaide & Brisbane.

THE EASIEST TAPE RECORDER TO USE: *SONY-O-MATIC



★ SONY-O-MATIC for automatic recording level control *(Exclusive to SONY*

TC. 123 SONY-O-MATIC

2 speeds. Capstan drive. 60 minutes dual track recording. Dynamic micr. Earphone monitoring. Easy control. Weight 4 lbs. Response 6,500 cps at 3¾ ips.

$60.90

TC. 900 SONY-O-MATIC

Battery and mains operated. Lightweight. Ideal for adding sound to film. 2 speeds, 7,000 cps at 3¾ ips. 2 track. Remote control micr. Tone control. Pause control. Fast forward.

$102.90

TC. 357-4 SONY-O-MATIC

4 track monaural recording and playback. Self-threading. 3 speeds. 7 inch reel cap. P.A. system. Dynamic micr. Instant stop. Lock facilities etc. Response to 15,000 cps at 3¾ ips.

$199.50

TC. 135 SONY-O-MATI

2 track monophone recording and playback. inch reel cap. 2 speeds Dynamic micr. Weigh 7lb. Instant stop. Records direct from radi TV, etc. Response 7,00 cps at 3¾ ips.

$94.5

SONY

RESEARCH MAKES THE DIFFERENCE

TRADE INQUIRIES TO:

JACOBY, MITCHELL & CO. PTY. LTD.

N.S.W.
469-475 Kent St.,
SYDNEY.
26-2651.

N.S.W.
E. Cupit P/L.
16 Wood St.,
NEWCASTLE.
61-4776.

VIC.
15 Abbotsford St.,
NORTH MELBOURNE.
30-2491.

QLD.
T. H. Martin P/L.
35 Charlotte St.,
BRISBANE.
2-1785.

S.A.
Farley and Fahy
Ltd.,
77 Wright St.,
ADELAIDE.
51-5117.

TAS.
K. W. McCulloch
Pty. Ltd.,
109 York St.,
LAUNCESTON.
2-5322.

W.A.
Standard Mercantile
Co.,
47 Monash Ave.,
Como, PERTH
67-3714

A.C.T.
H. C. Daynes
(Radiovision P/L.),
75 Investigator St.,
RED HILL.
9-4554.

TRADE RELEASES—IN BRIEF

COMTEL INTERNATIONAL (VIC.) PTY. LTD. say that the Truvox agency, previously held by Brown and Watson Electronics Pty. Ltd., has now been transferred to their company. This follows purchase of Brown and Watson Electronics by Comtel International.

RCS RADIO PTY. LTD., of 651 Forest Road, Bexley, N.S.W., would like us to remind readers that they are able to supply the printed wiring boards for all our projects for which they have been specified. Illustrated are the boards for the Transsistor Audio Oscillator of September, 1965, and the Protected DC Multimeter of October, 1965.

RCS also advise that in place of the bias oscillator coil originally specified for the "Playmaster 110" tape recorder, they are now supplying a complete basic oscillator assembly on a small printed board. The charge for the complete assembly is virtually the same as that for the original coil, making excellent value for money.

ROLA COMPANY (AUSTRALIA) PTY. LTD. will move its Sydney office from Caltex House, Kent Street, Sydney, to the premises of Ducon Industries, at Christina Road, Villawood. Both companies are now members of the Plessey Group in Australia. The new postal address is P.O. Box 2, Villawood, New South Wales. Rola Company says that advantage will be taken of the move to enlarge its service facilities to provide full service coverage of Rola's range of equipment and "Tele-message"; also the spare parts and capstan motor exchange services. Equipment should be addressed to: Plessey Components Group, Rola Company (Australia) Pty. Ltd., at the above address. Rail consignments should be sent to Leightonfield Station.

AMALGAMATED WIRELESS (AUSTRALIA) LTD. is making available to retailers through its Consumer Products Division Service Department a kit of 100 replacement capacitors for use in servicing the company's TV receivers. The quantity of each type of capacitor has been determined against the Service Department's own usage rates, and comprises 80 polyester, 16 paper and four styroseal types. Price for the kit $16 (£8) plus sales tax. Orders should be sent directly to the Service Department, at 67 Lords Road, Leichhardt, N.S.W.

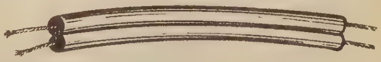
WATKIN WYNNE PTY LTD. has relinquished the A & R Tarnsformer franchise. All wholesale manufacturer and trade inquiries are now dealt with directly by A & R Transformers Pty. Ltd., or by their associated company, Soanar Electronics Pty. Ltd. Watkin Wynne advise that they still hold substantial stocks of A & R transformer products, and wil lbe able to meet orders for the time being.

FERRIS BROS. PTY. LTD. have announced changes in representation. Tyquin Distributors Pty. Ltd., of 13 Deacon Avenue, Richmond, Adelaide, is now distributing the full range of Ferris car and portable radios, Ferris/Channel Master TV aerials, Telecomponents TV and radio replacement parts and Ferris marine products. The territory covered by Tyquin Distributors includes all of South Australia except the south-eastern part, plus the towns and districts of Mildura in Victoria, and Broken Hill in N.S.W. The company's Mount Gambier representative, Mr Stewart Day, will continue to cover the south-east part of South Australia.

The Ferris Group has cancelled its arrangement with J. A. Parker Pty. Ltd. for representation of Ferris/Channel Master and Telecomponents products in the Orange area. Distribution of the company's products in the Orange district and the surrounding area is now undertaken directly from the Ferris premises at Brookvale, N.S.W.

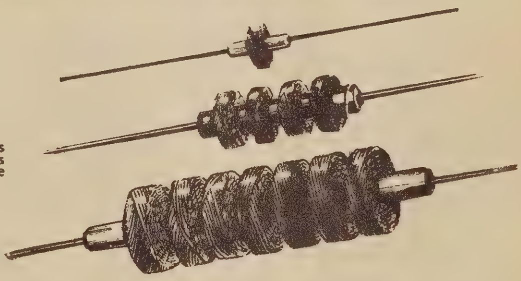
The company also advises that its Model 207 Gemini transistorised portable radio has been approved by all Australian State Electricity bodies for connection to mains supply. This receiver, together with the triple wave band Model 208, has been developed for operation either on internal 9V battery or from AC mains. All external parts are double-insulated.

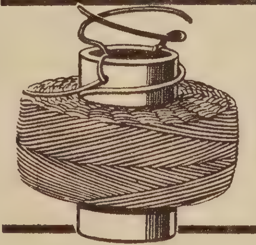
FERRIS/CHANNEL MASTER PTY. LTD. is marketing a new type of low-loss TV feeder cable, said to be of unique construction. It has twin 20-strand copper conductors moulded into polyethylene, and the resulting ribbon is then given a massive black "overcoat" of foam polyethylene insulation. Because of the resulting profile shape, the cable has been called Model 9567 "Figure 8" foam feeder cable. The new cable is intended for metropolitan fringe or deep fringe areas, even under conditions of heavy salting or extreme industrial fall-out. The construction is said to give great strength combined with extremely light weight, making the cable very suitable for long unsupported runs from mast or tower to house. Losses are reduced to a minimum because no moisture can pass up the conductors. Retail price is $12.50 (£6/5/) per 100ft.



*AEGIS COILS
The QUALITY'S Wound In!

R. F. & PEAKING CHOKES.
Our range of stock types is so wide that it covers most applications. Write for details.





Heavy Duty HONEYCOMB Type.
Illustrated is Aegis stock type S.87 air-cored cross-over network inductor, wound with 18 B. & S. wire. Inductance 1 milli-henry, d.c. resistance 0.6 ohms.
Also available from stock as type S.117, inductance 0.5 milli-henries.

VINKOR TYPE.
We manufacture and stock as standard lines practically all the Mullard-designed equaliser chokes and transformers for tape recorders, hi-fi tuners, etc., and are always pleased to quote for "specials."

Available from
all good radio parts
stores

*AEGIS
COMMUNICATIONS

Aegis Manufacturing Co. P./L.
347 Darebin Rd., Thornbury,
Victoria. 'Phone 49-1017.

A.28

He knows how to charm the audience with soft melodies and catchy sounds by reproducing his voice with all it's timbre . . . for he uses a microphone of high quality . . . a microphone from AKG. Such a microphone is the DX 11 which incorporates a reverberation unit.

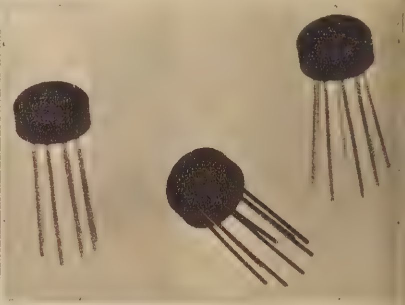
MICROPHONES

SOLD AND SERVICED BY AMALGAMATED WIRELESS (AUSTRALASIA) LTD.

SYDNEY 2 0233 • MELBOURNE 67 9161 • BRISBANE 4 1631
ADELAIDE 51 0111 • PERTH 28 3426 • LAUNCESTON 2 1804

FAIRCHILD Australia Pty. Ltd. have recently released three low-cost epoxy-encapsulated integrated microcircuits in TO-5 packages. They are the FuL900 Buffer / Inverter amplifier (code UX8990028X), the FuL914 dual two-input Gate (code UX8991428X) and the FuL923 J-K Flip-Flop (code UX8992328X).

Designed to operate at a supply voltage of 3.6V over the temperature range of 15-55 degrees C., the microcircuits are in the medium power range and will operate at speeds up to approximately 2MC. The FuL900 buffer is capable of supplying 16mA of current at 0.9V (a nominal fan-out of 80). The FuL914 gate performs the NAND/NOR logical function using RTL circuitry. The FuL923 is designed for use in industrial shift register and counting applications and is guaranteed to operate at 2MC.



Prices for these microcircuits in 1-24 lots are quoted as $2.20, $2.20 and $4.80 respectively, plus 25 per cent sales-tax where applicable.

Fairchild have also recently released a number of new PNP silicon epitaxial planar transistors: the 2N3639 and 2N3640 high-speed switches, the AY1102 RF amplifier, the AY1104 and AY1106 high current amplifiers, and the AY1110 low noise amplifier. The prices of these are quite attractive, with the 750MC (Ft) type AY1102 costing only 93c (9/4) plus tax in 1-24 lots.

Inquiries should be addressed to Fairchild Australia at 46 Caroline Street, South Yarra, S.E.1, Melbourne, Victoria, or P.O. Box 81, Epping, N.S.W.

WARBURTON FRANKI LTD., has appointed Mr Ray Adams resident manager, Canberra. In this position he will be responsible for company sales activities in Canberra and surrounding areas. Mr Adams took up residence on March 1 at 23 Majura Avenue, Dickson, Canberra (phone 4-7755). Mr Adams' former position of Instrument Division Supervisor has been taken over by Mr Ron Thomas.

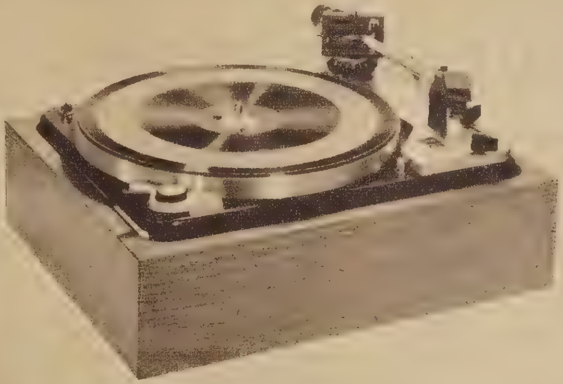
PYE INDUSTRIAL ELECTRONICS PTY. LTD. is the new name of the electronic heating division of the Pye Group in Australia, formerly known as Colville Wireless Equipment Pty. Ltd. A spokesman for the company said the change was dictated by recent rapid extension of the company's activities in providing radio frequency and low voltage heating equipment for Australian industries. The company retains its headquarters and manufacturing facilities at Carrington Road, Marrickville, N.S.W. Company representation in all other States is through Pye Industries Ltd.

CONVOY INTERNATIONAL PTY LTD., 449 Kent Street, Sydney, has provided information of two new additions to the company's range of electronic equipment.

Convoy 1 Watt Transceiver is a hand-held fully transistorised unit with plug-in type crystals, and featuring silicon output

NEW CHANGER-PLAYER FROM DUAL

Fred A. Falk and Co., Pty. Ltd. have recently announced the release in this country of the Model 1019 Auto/Professional turntable, an improved version of the highly regarded Model 1009 unit which we reviewed in these columns in Dec., 1963.



On inspection, the 1019 is very similar to the 1009 unit; it has the same heavy turntable (7 pounds plus), the same dynamically balanced tone arm with playing force dial adjustment, the same four-speed drive system with plus/minus 3 per cent fine speed adjustment, and all the other features which we noted in the December, 1963, review.

However, a closer inspection of the unit and its accompanying owner's manual reveals that the 1019 has a number of additional features designed to improve performance and operating convenience.

Perhaps the most obvious of these new features is the addition of a tone-arm lifting and lowering device for use in the "manual" mode of operation. The device is provided with silicone grease damping so that to lower the arm to the disc one need only flick the operating lever to the "down" position; the damping then ensures that the arm settles ever-so-gently on the disc, in perfect safety. This facility may also be used in the "automatic play" mode, although the auto lowering is quite gentle.

Another new feature possessed by the 1019 is a facility for groove bias force cancellation, termed by Dual "anti-skate compensation." This is done most neatly by a horizontal dial at the base of the arm pivot which adjusts a lever-and-coil spring system underneath; there are no strings or weights. One simply adjusts the dial as instructed, to suit the playing force and stylus in use.

Less obvious but none-the-less important features of the 1019 unit include a new "continuous pole" smooth-torque synchronous-induction motor, improved compliance and damping in the deck mounting springs, and a new clip-in drop-out cartridge holder in place of the previous slide-in type.

In short, the 1019 is a most versatile high-quality manual/auto player-changer, eminently suitable for the highest quality cartridges and amplifier systems.

Normally the 1019 may be obtained in three versions: without cartridge, with a crystal cartridge or with a magnetic cartridge. Unless specified the magnetic cartridge supplied is a Shure M44. Retail prices on a national basis are quoted as $134 without cartridge, $145.70 with crystal cartridge (code 1019/CDS) and $160 with magnetic cartridge (code 1019/M). The usual trade discounts apply.

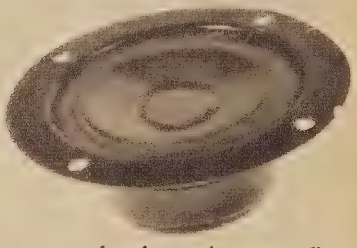
Inquiries should be directed to audio dealers or direct to Fred. A. Falk and Co. Pty. Ltd., at 28 King Street, Rockdale, N.S.W. (J.R.)

J.H.R. Release Svenska Tweeter

J. H. Reproducers Pty. Ltd. announce that they are releasing in Australia a 2-inch tweeter, model U-2275, produced by Svenska Hogtalarefabriken A.B., Sweden. It has a ferrite magnet giving a flux density of 9000 gauss and will retail in Australia for $12.00.

A frequency run indicated that the effective response of the unit is from something under 2KC to about 15KC, though the small cone area and the manufacturer's ratings suggest that it would most appropriately be used with a divider network crossing over at 5KC.

The unit was tested under these conditions in a Playmaster Bookshelf unit and performed very well indeed. Its sealed-back construction has an obvious advantage for fully sealed enclosures, while the small size is also attractive where space is likely to be a problem. Sensitivity is of the same general order as that of locally produced tweeters with which it will have to compete.



The new tweeter will be distributed through regular trade outlets by J. H. Reproducers Pty. Ltd., 199 Waverley Road, East Malvern, Victoria.

---

transistors, squelch and noise limiter, harmonics filter, collapsible aerial (eight sections, 5ft maximum length), battery life indicator, and push-to-talk operation. Power input to the final stage is 1W; receiver sensitivity is 1uV maximum (10dB).

"Sirophone" is a combined loudhailer-siren. For emergency announcements, the siren is sounded by pressing a small red button. When the attention of the desired audience has been obtained, the siren is silenced by a second pressure of the button, and the announcement is then made via the loudhailer facility. The unit is carried by a sling, and has a separate microphone, so that the whole unit does not have to be lifted to the mouth.

R. H. CUNNINGHAM PTY. LTD., of 8 Bronham Place, Richmond, E.1., Victoria, has available a range of small hand-held dynamometers of French manufacture, said to be suitable for measuring a variety of tensions. The Carpo Dynamometers can be used for measuring and calibrating tensions used in precision apparatus such as electrical contacts, relays, clockwork, motor brushes, switches, etc., and for standardising measuring devices such as comparators and gauges of many types. Measurements are precise to plus or minus 2 per cent. The device is made in two sizes, the small size covering ranges 0-3 grams to 25-150 grams; and the large size from 50-250 grams to 250-2,000 grams. Prices will be given by R. H. Cunningham on request.

DUCON INDUSTRIES has now established its own offices in Brisbane and Adelaide. The Brisbane office is at the corner of Fortescue and Wells Streets, Spring Hill (phone 2-3287). The Adelaide office is in premises at 246 Gilbert Street, Adelaide (phone 51-4755). The company's Melbourne office has been moved to new premises at Westbank Terrace (off Bridge Road), Richmond. Postal address is Box 5, P.O., Richmond, and phone number is 42-3921. Ducon products will continue to be handled in Western Australia by H. J. McQuillan Pty. Ltd., 1017 Wellington Street, Perth, and U.C.C. products by O. F. Gamble Pty. Ltd., 888 Hay Street, Perth.

AMALGAMATED WIRELESS VALVE CO. PTY. LTD., announces that it is in production with two new travelling wave tubes Types N1055 and N1056. These are wideband power amplifiers with a nominal gain of 37dB, working power output of 10W and typical saturation output power of 16W. Type N1055 is designed for operation in the frequency range 5.6 to 7.2GC; and the N1056 for 3.6 to 4.2GC. These tubes have been developed primarily for microwave communications applications. Specific features are extremely low AM/PM conversion and low noise factor, enabling cross-talk and distortion in multichannel links to be kept to a minimum. (Amalgamated Wireless Valve Co. Pty. Ltd., 47 York Street, Sydney.)

ELECTRICIANS
TV TECHNICIANS
HAMS

THE FAMOUS

PENETROX 'A'

ALUMINIUM
CORROSION
INHIBITOR

Price $1.25 post paid

PENETROX 'A' ● breaks down oxide — providing clean, metal-to-metal contact ● distributes current evenly among all cable stands ● seals indefinitely against the oxidising and corroding effects of air and moisture.

WILLIAM WILLIS & Co. Pty. Ltd.
Manufacturers and Importers
428 ELIZABETH ST., MELBOURNE

A. C. E. AMPLIFICATION COMMUNICATION ELECTRONICS

★★★★★★★★★★★★★★★★★★★★★★ PHONE 51-3845

RADIO

636 KING STREET, NEWTOWN—51-7008

136 VICTORIA ROAD, MARRICKVILLE — 51-3845

B.S.R.

4-TRACK DECK

$35.50 £17/15/-

2-Track, 3-Speed.

$35.50 £17/15/-

4-Track, 3-Speed. Mono or Stereo.

$45.25 £22/12/6

4-TRACK. 3-SPEED.
3 HEADS.

$49.50 £24/15/-

BRADMATIC HEADS
Latest ½-Track. Hi Fi.

$9.50 £4/15/- pair

THE NEW COLLARO TAPE DECK

Takes 7in spool.
3 speeds: 1⅞, 3¾, 7½ i.p.s.
2-track, $44.
4-track, $48.
Write for particulars.

TRANSISTOR POWER SUPPLIES

12v. D.C. Input. 300v. 150Ma. Output plus 150v. Output.

$23.75 £11/17/6

12v. D.C. Input. 400v. 150Ma. Output plus 200v. Output.

$29.75 £14/17/6

VARY. A.C.S.

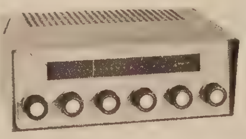
240-270V 50 cycle 5 amp.
Provide infinitely variable AC voltage

$29.50 £14/15/-

2½ Amp as above

$23.50 £11/15/-

PLAYMASTER 106 AND 107



Feb. and March R. TV & H.

106

WIRED AND TESTED. $88.75

107

WIRED AND TESTED. $79.00

ELECTRIC GUITAR

Pickup Units	$8.75
Accordion Pickup Units	$8.75
Harmonica Pickup Units	$1.95

Post., N.S.W. 40c; Interstate, 75c.

TRIO W26 STEREO-TUNER AMPLIFIER

12 watts per channel.
Mag. P.U., Crystal P.U., Tape In-Out, Broadcast, Stereo, S.W. Mono.

$138.00 -- -- -- £69

SEE TRIO. ADVERT.

Transistor-Ignition HI-SPARK

Simple installation.
38 K.V. output.
Complete. Tested.
Negative earth.

$33.50 £16/15/.

Positive earth.

$41.50 £20/15/-

State voltage and polarity.
Post., N.S.W., 75c; Interstate, $1.25.

CITIZENS BAND

27.240 Megs.
10 Transistor Transceivers.
100 M.W. output.

$45.00

1 watt. 15 transistor, with squelch provision for two channels. Range to 10 miles under ideal conditions.

$80.00 £40 each

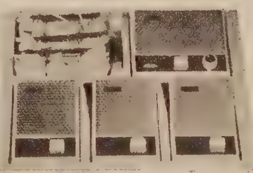
INTER. COM. UNITS

2 Station Transistorised

$11.50 £5/15/-

4 Station, including Master

$20.25 £10/2/6



New Telephone Amplifier

Transistorised.

$11.50 £5/15/-

Post 35c.

T.V. TUNERS

New 10-channel Tuners.

$15.00 £7/10/.

Post 75c.

LATEST 4-SPEED PLAYERS

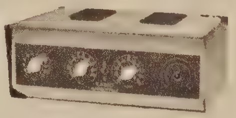
240V A.C. Mono	$11.50
240 A.C. Stereo	$17.00
Battery Mono	$19.50
Battery Stereo	$21.50
Battery Mono 45 r.p.m. in Cabinet	$9.25

Post., N.S.W., 75c; Interstate, $1.25.

Send for full details on Radiogram Chassis, TV and Amplifiers.

AMPLIFIERS

Public Address Range
240V-AC



MINIATURE P.A. AMPLIFIER.
15 WATTS OUTPUT.

Multi Match Ferguson O.P. transformer input for crystal mike and pick-up with electronic mixing. P.P. EL.84 output	$39.50
30 Watt. As above EL34 P.P.	$53.50
40 Watt. As above EL34 P.P	$79.50
60 Watt. As above EL34 P.P.	$98.50

LINE OR VOICE COIL TRANSFORMERS.
MULLARD HI-FI RANGE.

5/10 with pre amp base and treble boost. Ultra Linear output	$43.50
5/20in. As above	$65.50

BATTERY-AC OPERATION

6 valve 6v plus 240v-10 watt	$55.50
7 valve 12v plus 240v-12 watt	$59.75
7 valve 12v plus 240v-25 watt	$71.75

TRANSISTOR P.A. AMPLIFIER C.A.-512

12VDC Operation.
Output 20 watts.
Current consumption at max. output. 2.2 amps.
Input. High imp. mic. Also 600 ohms and tape.
Independent gain controls.
Output: Imp. 4-8-16 ohms.
Freq. Response:
200 cps—6000 cps.
Dimensions: 2in x 6¼in x 8½in.
Complete with instruction book with circuit. All plugs.

PRICE $57.50

DYNAMIC MICROPHONES

DM-391 HI-Imp	$3.50
DM-175 HI-Imp	$4.75
DMS-3 HI-Imp	$5.50
DM-305. 600 ohms or HI-Imp. Suitable stand mounting	$9.75
DM-304. Dynamic Cardiold. 50 ohms or HI-Imp. Suitable stand mounting	$15.75
D.M. 307 HI-IMP.	£7/10/-
CM-10 Crystal HI-Imp. Suit stand mount.	$5.06

Post., N.S.W., 25c; Interstate, 35c.

WIDE RANGE LIGHTWEIGHT STEREO PICK-UPS

Ceramic Units, Sapphire Styli	$7.00
Diamond Styli	$10.50
Universal Ceramic Stereo Cartridge, Sapphire Styli	$2.95
Diamond Styli	$6.50

NEW WIDE RANGE SPEAKERS

15 ohm. Twin Cone

8in	$7.00
12in	$7.90
5in	$4.50
5in Tweeter	$3.75
4in Single Tweeter	$2.75
12in Heavy Duty 20 watt	$15.50

P.A. REFLEX HORNS

WITH UNITS

5 Watt 8 ohm	$14.50
10 Watt 8 ohm	$26.50
35 Watt 15 ohm	$18.00

N.B.: As these are American ratings, divide the wattage by 2.

STEREO RECORD CHANGERS

1965 model, 4-speed.

$21.50 £10/15/-

De Luxe Model.
Fully machined and balanced. Heavyweight turntable. Ceramic cartridge.

$27.50 £13/15/-

Post. N.S.W., $1.25; Interstate, $1.75

STEREOPHONIC HI-FI HEADPHONES

With padded earpieces

SPECIFICATION:
Frequency Response: 25-17,000 cps.
Nominal Power 1 watt.
V.C. Imp. 8 ohms each channel.

$7.75 £3/17/6

Post., 50c.

PHILIPS DISC JOCKEY

4-speed Players.
6V, D.C. OPERATION.
MONAURAL CRYSTAL HEAD

$9.75 £4/17/6

STEREO

$11.75 £5/17/6

Post., N.S.W., 75c; Interstate, $1.25.

MORSE KEYS

New lightweight, fully adjustable units

95c

As above with buzzer.
Complete Morse practice set.

$1.65

A. C. E.

AMPLIFICATION

COMMUNICATION

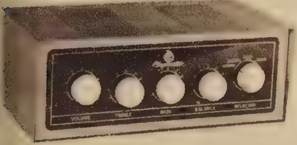
ELECTRONICS

★★★★★★★★★★★★★★★★★★★★★PHONE 51-3845

RADIO

636 KING STREET, NEWTOWN—51-7008

136 VICTORIA ROAD, MARRICKVILLE — 51-3845

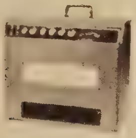


PLAYMASTER 4 STEREO AMPLIFIERS

Push-Pull. 8 Watt per Channel. Bass and Treble boost and Cut. Wired and Tested.

£38/10/- $77.00

Buyers please note: Due to component and production cost increases we regret the price of P.A. Amplifiers, Guitar Amps. and Stereo Amps. will be increased in the near future.



GUITAR AMPLIFIERS

10-Watt, Two Channel, with Twin Cone Speaker, $51.50 (£25/15/).

14-Watt, 4 Inputs, Bass and Treble Boost. 2 Twin Cone Speakers, $59.50 (£29/15/).

17-Watt. Four-Channel. Bass and Treble Boost. Two Twin Cone Speakers, $73.75 (£36/17/6).

35 WATT

4-Channel, Bass and Treble Boost. 4 Twin Cone Speakers, $105 (£52/10/).

60-Watt, 2 Unit
4-12in Auditorium Speakers,

$161.75 £85/17/6

Vibrato with foot control and 2 pre-set controls for frequency and intensity. $10.56 (£5/5/) extra on above models.

14 plus 14 WATT

With Reverberation. May be used as 28 Watt or as 14 Watt plus 14 Watt Reverb. Two 9 x 6 Woofer Speakers. Two 9 x 6 Twin-Cone Speakers. 4 Channels. Bass and Treble Boost. Foot Vibrato Control included.

$163.50 £81/15/-

SLAP BASS OR BASS GUITAR 40 WATT AMPLIFIER

4 Input Channels. Bass and Treble Boost. Two 12in Radial Beam Speakers. Perfect reproduction on 20 cycles.

$145.75 £72/17/6

PIGGY BACK GUITAR AMPLIFIER

30 Watt	$79.75
45 Watt	$99.75
60 Watt	$119.75

4 Inputs. Bass and Treble Boost. Vibrato if required. $10.50 extra.

£72/10/ $145.00

1965 COMMUNICATIONS 8

R. TV and H., January

This outstanding receiver for Ham or General use.

Wired — Tested Guaranteed

With mechanical filter.

£20 $40 Extra

TRANSISTOR CAR RADIO

Push-button operation. High sensitivity. Tailored to fit most modern cars. 6v or 12v operation — state voltage. Polarity and speaker size.

$58.00 £29 Complete

NEW RECORDING TAPE

	£	s	d
3in. Mylar LP 300ft.		10	6
5in. Mylar LP 900ft.	1	0	0
5in. Mylar DP 1200ft.	1	5	0
5¾in. Mylar LP 1200ft.	1	5	0
5¾in. Mylar DP 1800	1	17	6
7in. P.V.C. 1200ft.	1	5	0
7in. Mylar LP 1800ft.	1	17	6
7in. Mylar DP 2400ft.	2	10	0
10½in. Mylar LP 3600ft.	3	15	0

Post 2/6 per Spool.

P.A. SPEAKERS

8 WATT

8in Units in Waterproof Projection Horns. 15 Ohm Voice Coils.

$13.50 £6/15/-

In Double Ended Flares. Duolateral Coverage.

$14.50 £7/5/-

Line Output Transformers to suit, $1.75 (17/6) extra.

P.A. SPEAKER DRIVER UNITS

American Rating. 30 Watts. Voice Coil 16 ohm.

$21.50 £10/15/-

15 Watt Rating.

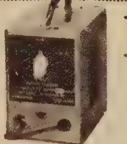
$15.75 £7/17/6

REFLEX HORNS TO SUIT.

$21.50 £10/15/-

WEEKEND — HOLIDAY — EVENING DEMONSTRATIONS AT COLLAROY

PHONE XW5956 FOR APPOINTMENT TO TEST STEREO GUITAR AMPLIFIERS AND TELEVISION.



BATTERY CHARGER

240 Volt A.C. Operation

3 Rate 6V, 12V TRICKLE CHARGE

Trickle Charge Position suits all Batteries. 2V to 12V at rate of 200 to 500 M.A.

STANDARD	
2 amp. 6V, 12V, TRC	$11.50
3 amp. 6V, 12V, TRC	$12.25
4 amp. 6V, 12V, TRC	$15.25
5 amp. 6V, 12V	$15.95

Post., N.S.W. 75c, Interstate $1.25

DE LUXE	
1½ amp., 6V-12V	$9.75
3 amp.	$16.75
4 amp.	$19.75
6 amp.	$21.75
10 amp.	$27.75

Rail or Air Freight on.

Complete $28.50

PLAYMASTER BOOK SHELF UNITS

To R, TV & H specifications. Mountain Ash, Maple or Walnut formica finish.

ALSO CABINETS ONLY

To suit 6", 8" and 12" speakers

6"	8"	12"
$12.50	$15.50	$17.50

REVERBERATION UNITS

Latest design to suit organs, stereo, guitar, any hi-fi equipment.

£2/17/6 $5.75

Post. 3/6.

ELEGA REVERB. SPEAKERS

Automatic addition of reverberation to any existing amplifier. Handles 12 watts.

£12/15/- $25.50

CO-AXIAL SPEAKERS

C.S-30. 12"

V.C. 16 ohm. Cross over 3,000 cycle. Frequency range 30 to 20,000 cycles. Rated 20 watts.

£13/19/6 $27.95

C.S-20. 8"

V.C. 16 ohm. Cross over. 3,000 cycle. Frequency Range 40 to 20,000 cycles. Rated 8 watts.

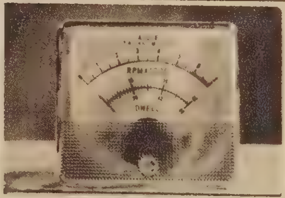
£7/19/6 $15.95

HORN TWEETER

CT-3

2,000-20,000 Response.
20 Watts Power.
Sensitivity 110 dbw.
Weight 1¾lb.

£4/9/6 $8.95



MULLARD-A.C.E. TACHOMETER

Wired and tested.

$20.75 £10/7/6

"Electronics Australia," July, August issue. State max. revs., voltage, polarity cylinders.

METER ONLY

$6.75 £3/7/6

INCLUDING DWELL. ANGLE FACILITY

$23.25 £11/12/6

Post., N.S.W., 50c; Interstate, 75c.

A. AMPLIFICATION **C.** COMMUNICATION **E.** ELECTRONICS

★★★★★★★★★★★★★★★★★★★★★★PHONE 51-3845

RADIO

136 VICTORIA ROAD, MARRICKVILLE, SYDNEY,
AND 636 KING STREET, NEWTOWN—51-7008

EVENINGS and WEEKENDS: "KALUA," Hilma Street, Collaroy Plateau, XW5956
DULWICH HILL, EARLWOOD, BUS STOPS AT DOOR, STOP No. 42

NEW

HOME LIGHT BATTERY

CLYDE OR DUNLOP
19 Plate. 150 Amp.
Dry Charged. Cells.

$3.25 £1/12/6 ea.

A.C. D.C. MOTORS

32V and 110V.
High Speed, Series Wound.
1/8 h.p. motors.

$3.75 £1/17/6

Post N.S.W. 75c, Interstate $1.25.

NEW VALVES

1A3	75c
1A5	75c
1C5	75c
1C6	$1.25
1C7	50c
1D5	55c
1F5	$1.00
1G4	75c
1H5	75c
1H4	75c
1J6	$1.25
1K7	50c
1L4	50c
1M5	50c
1N5	75c
1Q5	50c
1T4	$1.00
6AR6	$1.25
6AN7	$1.00
6AS7	$1.00
6B6	75c
6B8	75c
6BF6	$1.00
6BL8	75c
6BM8	75c
6C8	75c
6F6	$1.00
6G6	75c
6J6	75c
6J6	$1.00
6J7G	75c
6K6	75c
6K7	50c
6N7	75c
6SA7 Metal	75c
6SC7	$1.00
6SF7	$1.00
6SG7	$1.00
6SH7	40c
6SJ7	95c
6SK7	$1.25
6SN7	75c
6SS7	$1.25
6X5	75c
7C5	50c
7N7	75c
7W7	50c
12A6	50c
12AT7	$1.00
12BE6	$1.00
12BH7	75c
12C8	$1.25
12SJ7	$1.25
2A3	$2.00
2C26	75c
2X2-879	50c
3A4	$1.25
3B7	$1.00
3D6	$1.00
5X4	$1.00
5Z4	$1.00
6AC7	75c
6AG5	95c
6AG7	$1.00
6AJ5	50c
6AK5	$1.00
6AL5	75c
6AM5	75c
6AM6	75c
6AN5	$1.25
12SK7	50c
12SL7	$1.25
47	$1.25
76	75c
84/624	$1.25
304TH	$3.00
723A	$6.00
807	$2.00
809	$1.75
813	$7.00
829B and Socket	$5.75
866A	$1.50
954	50c
1603	50c
1616	75c
1619	$2.00
1629	50c
1050	$2.00
9006	50c
AV11	25c
CA19	$10.50
CK1013	$1.50
CV63	75c
CV66	75c
CV1102	75c
CV1133	75c
CV1136	75c
EBC33	75c
EC70	40c
ECH33	$1.50
EF36	75c
EF37	75c
EF39	75c
EF72	40c
EF73	40c
EK32	$1.50
EL91	$1.00
KTW62/6U7	75c
RL27	$1.50
RK34	75c
RK75	$1.00
RK84A	$6.00
VR65	50c
VR75/30	$1.50
VR105/30	$1.50
VR150/30	$1.50
VT502	$1.25
32	$1.00
42	$1.00
45	$1.00
37	$1.00
49	$1.00
53	$1.00
59	$1.25
63	$1.00
89	$1.00
77	$1.00
2V3	75c
CL4	$1.25
EM1	$1.25
TZ40	$1.00
6AB7	75c
6C6	$1.25
6F7	$1.25
6SC7	75c
7A6	75c
9006	50c

GENEMOTORS

Input	Output		
12v	600v 300mA	New	$11.00
12v	500v 350mA		$17.00
12v	1200v 200mA		$13.00
24v	250v 100mA	New	$4.00
24v	540v 200mA	New	$4.00
24v	300v 250mA	New	$5.50
12v	275v 110mA		$7.50

CHASSIS PUNCHES

SIZES ⅝", ¾", ⅞", 1".
1⅛" with tapered
Reamer and Carry Box.

$5.75 £2/17/6

Post 50c, Interstate $1.00.

NEW POWER TRANSFORMERS

1960 5in CRO	$11.75
325 x 325 150MA	$9.50
285 x 285 300 MA	$14.70
800V and 270V 300MA	$15.00
240V-110V 1.3KVA Auto	$21.00
150 x 150V 30 MA	$2.75
225 x 225V 40 MA	$3.00
124V Doubler 300MA	$6.75
130V Doubler 400 MA	$7.75
145V Doubler 450 MA	$9.75
150V Doubler 500 MA	$10.75
220V Doubler 600 MA	$14.70
310 x 310 170 MA	$4.95

3" SELSYN MOTORS—TRANSMITTERS

50 V AC — 50 cps.

$5.75 £2/17/6

Post 75c, Interstate $1.00.

RELAYS

6V, 3-pole Miniature	$1.50
12 volts, DPDT, 5 amp	$2.00
12 volts DPDT	$1.25
100pf TX var. condensers	$1.00
Hi-speed Polarised relay	$5.00

PMG TYPE 3000

2000 ohms, $1.25
1000 ohms, $1.25

Lapel Crystal Mikes	$1.25
Crystal Mikes with switch	$1.50
Telephone Pick-up Units	$1.25
Contact Pick-up Units	$1.50
100UA Stereo Bal Meters	$3.50

OIL FILLED CONDENSERS

.5mfd 600V	35c
2mfd 600V	65c
1mfd 600V	65c
4mfd 600V	65c
4mfd 2.5K	$3.00
1mfd 3000V	$1.70
.5mfd 5K, .1 5K, .1 3K AC .25 4K, .5 2½K ea.	$1.50
4mfd 3000	$3.50
2mfd 3000	$2.50
1 mfd 3000	$2.00
1.25 mfd. 6000v.	$4.50
mfd. 4000v	$3.00
2 mfd. 2000v	$1.50
4 mfd. 1500v.	$1.50
1 mfd. 1500v.	$1.00
8 mfd. 600v.	$1.00
1 mfd. 1000v.	$1.00

PYE REPORTER

2-way Vehicle Band Transceivers.
Ex-Taxi Cabs.
12 volt, 70 meg. Complete with valves and speaker.

$33.75 £16/17/6

NEW C.R.O. TUBES

3API-906 3in	$2.75
CV112 5in	$2.00
VCR97 6in	$3.75
ACR10/VCR139A 3in	$3.00
CV1522 1¾in	$2.25

6" INDICATOR UNITS

TYPE 1A
Suitable for C.R.O. conversion.
Circuit supplied.

$20.75 £10/7/6

NEW 3-GANG CONDENSERS

300 PF + 200 PF + 60 PF

75c 7/6

NEW HEADPHONES

5 Ohm	$2.25
2000 Ohm	$2.25
4000 Ohm	$2.50
American Lightweight	$1.25
Australian DLR	$1.25
Dynamig Earpieces, pr.	45c

Post 25c pr.

100 NEW ASSORTED RESISTORS

Mainly I.R.C., ½, 1.2 Watt.
04 Values. ½ ohm to 10 megs.

$1.50, Post 25c

100 new assorted Condensers.
Paper, Mica, Ceramic Metalcap.
25 Values.

$2, Post 25c

WANTED

Communications Receivers. Test equipment. P.A. Gear. Large or small surplus stock. Best prices. Call, write or phone, any time.

TRANSISTORS

MT-71-OC71	75c
2N174	$5.00
2N442	$4.50
2N441	$4.00

High-powered units for 75-watt audio, 200-watt power units or transistor ignition.

T.B.Y. TRANSCEIVERS

20 to 80 Megs. Battery Operated.
4 Band units. Variable tuning.

$29.75 £14/17/6

Complete with aerial, Headphones, microphone, junction box, plugs and cables.

$39.75 £19/17/6

NEW G.M.F.

1/8 H.P. 240V-A.C. Motors.
2 speed. Reversible.
Capacitor Start.
Double ended drive.
Ball bearings.

$5.50 £2/15/-

NEW METERS

Square. Clear Plastic.

2¼in 50 UA	$4.75
3⅜in 50 UA	$5.75
2¼in V.U. Meters	$4.75
3⅜in ImA	4.75
2¼in 500V. A.C.	$4.25
2¼in 500V. D.C.	$3.50
3⅜in 500V. A.C.	$5.75
3⅜in 500V. D.C.	$5.00

Post N.S.W. 25c, Interstate 40c.

INTER COM TELEPHONES

15 Line Connections.

$7 £3/10/- each

PILLOW PHONES

Low Imp. VC Matchings.
Ideal Hospitals, etc.

$1.75 17/6 each

COMMUNICATIONS RECEIVERS

B.28—CR100

Current Navy Receiver.
6 Band .40 K.C. to 32 Meg.
Variable Selectivity. 2 R.F.
2 I.F. Stages. Crystal Gate Band Spread. New condition. Air-tested.
Realigned 240V A.C. operation.

$130.00 £65/-/-

AR7 RECEIVERS

Air-tested, realigned. Perfect order.

$115.00 £57/10/-

MECHANICAL FILTER

For SSB Receivers.
455 KC. Balanced or unbalanced as required.

$33.75 £16/17/6 Post 50c.

3BZ RECEIVERS

AIR TESTED. PERFECT ORDER.
6v. Operation. 6 Band.
200 K.C. to 30 Megs.
Ideal communications Receiver or mobile and small ships' use.

$55.00 £27/10/-

3BZ TRANSMITTERS

12V Operation. 15 Watt O.P.
2 to 9 Megs.
Air Tested. Perfect order.
Suit small ships, Bush Fire Brigades, Island Services.

$55.00 £27/10/-

522 TRANSCEIVERS

Complete With Valves.
100 to 156 Megs.

$25.75 £12/17/6

522 TRANSMITTERS

Complete With Valves.

$13.50 £6/15/-

522 RECEIVERS

Complete With Valves.

$11.50 £5/15/-

NEW ROTARY CONVERTERS

160 watt, 50 Cycle.
24v to 32v input.
Output can be supplied for 50-110 or 240v as required.
Suit radiograms, TV, Tape Recorders, Fluorescent Lights.

$39.75 £19/17/6

450 Watt, as above.

$73.75 £36/17/6

PHILIPS No. 4

COMMUNICATION RECEIVERS
6V Operation, 500 KC to 18 megs.

$45.75 £22/17/6

A. AMPLIFICATION
C. COMMUNICATION
E. ELECTRONICS

★★★★★★★★★★★★★★★★★★★★★★★ PHONE 51-3845

RADIO

636 KING STREET, NEWTOWN—51-7008

K 20 CT330 **K 20 CT500**

220S 4000 O.P.V.

D.C. Volts 5, 25, 125, 500, 2500. A.C. Volts 10, 50, 250, 1000. Current: 250uA, 250mA. Resistance: 0-10K, 0.1 Meg.

£3/19/6 Post 5/-

C.T.330 20K.OPV

D.C. Volts, 6, 6, 30, 120, 600, 1200, 3000, 6000. A.C. Volts, 6, 30, 120, 600, 1200. D.C. Current, .06-6, 60, 600mA. Resistance, 6K, 600K, 6meg., 60meg. D.B. minus 20 to plus 62. 5 Ranges. Specially suitable for transistor use. **$15.95** Post., 50c.

C.T.500 20K.OPV

D.C. Volts, 2.5, 10, 50, 250, 500, 1000. A.C. Volts, 10, 50, 250, 500, 1000. D.C. Current, .05, 5.50, 500mA. Resistance, 12K, 120K, 1.2 meg., 12meg. D.B. minus 20 to plus 62.

$13.25 Post., 50c.

S.E.550 100K.OPV

D.C. Volts, .5, 2.5, 10, 50, 500, 1000. A.C. Volts, 2.5, 10, 50, 250, 1000. D.C. Current, 10uA, 2.5, 25, 250mA, 10 amps. Resistance, 2K, 200K, 2M, 20M. D.B., minus 20 to plus 62.

$20.75 Post., 75c.

P.T.34 1000.OPV

D.C. Volts, 0, 10, 50, 250, 500, 1000.
A.C. Volts, 0, 10, 50, 250, 500, 1000.
M.A. 1-100-500 RESISTANCE.

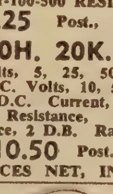
$5.25 Post., 50c.

200H. 20K.OPV

D.C. Volts, 5, 25, 50, 250, 500, 2500. A.C. Volts, 10, 50, 100, 500, 1000. D.C. Current, 50uA, 2.5, 250mA, Resistance, 6K, 600K. Capacitance, 2 D.B. Ranges.

$10.50 Post., 50c.

ALL PRICES NET, INC. S.-TAX.



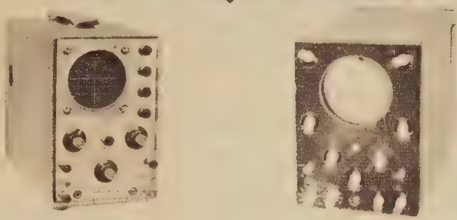
V.T.V.M.

27 Ranges, A.C. Powered.
D.C.V. 0, 1.5, 5, 15, 50, 150, 500, 1,500.
A.C.V. 0,1.5, 5, 15, 50, 150, 500, 1,500 R.M.S.
A.C.V. P. to P. 0, 1.4, 4, 14, 40, 140, 400, 1,400, 4,000.
Resistance, 1 ohm to 1,000 megohm.
D.B. Minus 10 D.B. to plus 65 D.B.

$42.50

Post., $1.
H.V. Probe to 30 KV, $53.50.
T.M.K. Units. $53.50.

TEST EQUIPMENT



WIDE BAND OSCILLOSCOPE

5 Meg. Bandwidth. Push-pull vertical and horizontal Amplifiers. 8 position, high sensitivity vertical Amplifier, Frequency Compensated on all positions. Calibrated .02 to 600 volt. Hard-time base, 20 cycles to 75K. Latest American R.C.A. circuitry. Complete with probe.

3-inch $99.75; 5-inch $111.50

4 CHANNEL MICROPHONE MIXER PRE AMPLIFIER

$7.75

Post., 50c.

TRANSISTORISED VARIABLE POWER SUPPLY

Range to 20V, 200MA

$18.75

Post., 50c.

G.D.O. UNITS

Leader. 810. 6-Band. 2 Meg. to 260 Meg. Nuvistorised. 240 V.A.C. Operation. Modulated. Calibration. Accuracy 2 per cent.

$41.50

T.E. 18 Lafayette. 8 Bands. 360 K.C. to 260 Megs. 240 V.A.C. operation.

$39.50

Post., N.S.W., 50c; Interstate, 75c.

MINILAB 7in 1 MULTIMETER

$16.75

Post, 50c.

STEREO PRE AMPLIFIER

240 V. A.C. Power.
To suit magnetic P.U. tape or microphone.
Response: 20 to 20.000 cycles.
Gain 60 D.B.

$15.50

Post., 50c.

LEADER SWEEP & MARKER GENERATOR

TV and F.M. 2 to 270 Megs. 5.5 Meg. Crystal for TV sound. Sweep width to 12 Megs. Model 531.

$139.00 £69/10/-

Model 532

$170 .00 £85/-/-

Post., N.S.W. $1.50; Interstate, $2.50

PANEL METERS

EDGE TYPE

1 mM. Scaled. S. Meter. Stereo Balance. Tuning. **$2.50**

2" 3" 4" PLASTIC COVERED PANEL UNITS

Latest P series ¾in Barrel 50mmA, 200mmA. 1mA, 10 mA, 500mA, 1 Amp, 10 Amp, 15V. 500V. **From $3.00**

T.E. 20 RF SIGNAL GENERATOR

Freq. 120KC—260MCS in 6 bands.
Output (RF)—High 100,000uV max. Low 100uV max.
Output (Audio)—400 cps approx. 8V.
Modulation — 400 cps internal.
Operation — 240V AC.
Dimensions 7in x 10½in x 5½in.
Weight — 9lb.
Complete with Instruction Book circuit.

$26.50 £13/5/-

Post., N.S.W., 75c; Interstate, $1.25.

LEADER SIGNAL GENERATOR LSG 11

240v A.C. Powered.
6 Band, 120 Kc to 390 Megs.
Provision for Crystal.
An Ideal TV Marker Generator.

$26.50

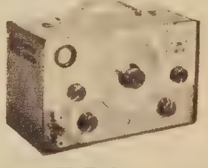
Post., N.S.W., 75c; Interstate, $1.25.

SIGNAL INJECTOR

Transistorised. Fountain Pen-sized Unit for Signal Tracer in Radio, TV and Amplifier Service.

$4.75

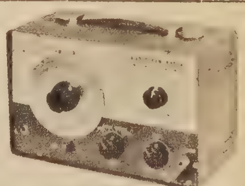
Post., 25c.



T.E.46 RESISTANCE-CAPACITANCE

Bridge and Analyser.
Capacity 20 pfd to 2,000 mfd.
Resistance 2 ohm to 200 megs.
Also tests power, factor, leakage, impedance, transformer ratio, insulation resistance to 200 megs. at 600V.
Indications by eye and meter.

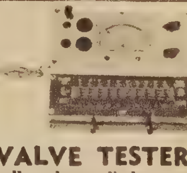
$51.95



T.E.22 AUDIO GENERATOR

Sine and Square Wave.
20 Cycles to 200 K.C. 4 Bands.
Frequency response plus/minus 1.5 D.B.
60 Cycles to 150 K.C.
Output impedance 5,000 ohm.
Output volts, 0 to 7.

$44.25



VALVE TESTER

Tests all valves, diodes, rectifiers, checking filaments, shorts. Merit on direct reading. Good-bad meter. Complete with tube chart.

$26.75

Post., N.S.W., 25c; Interstate, $1.25.

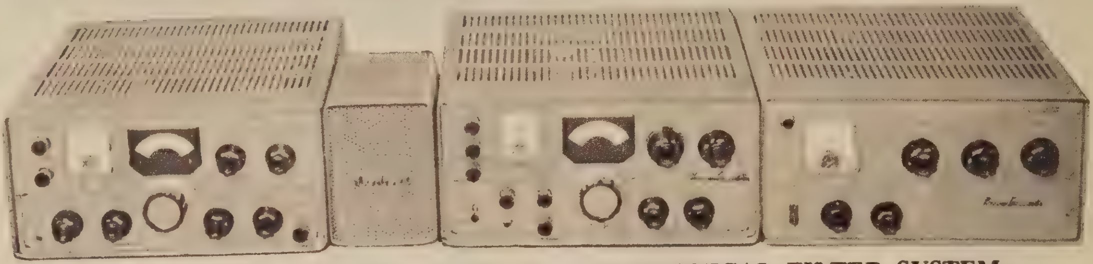
T.E. 50.—99—5011

Checks. Nu Vistas, Compactrons, etc

$34.25

F-SERIES S.S.B. EQUIPMENT

PROFESSIONAL QUALITY AT AMATEUR PRICES



COMPACT TABLE-TOP STATION — MECHANICAL FILTER SYSTEM
FIVE BANDS, 80-10 METRES — TRANSCEIVE OR NORMAL OPERATION

FR-100B: RECEIVER SSB-AM-CW dual conversion with crystal locked front end, two mechanical filters for best reception of SSB and AM, high reduction precision gear driven dial reads to 1 KC. Crystal filter for CW. ANL, "S" meter, AGC, SSB clarifier. Built-in monitor. Additional crystals available for 100 KC calibrator, full 10m coverage, WWV and three SW ranges. A professional quality receiver for the Amateur, or discriminating SWL. £209/10/ ($419).

FL200B: TRANSMITTER SSB-AM-CW, 240 P.E.P. input with two 6JS6 (similar 6DQ5) tubes in P.A., working within ratings for longer life! Solidly constructed and neatly wired, with high quality components, ceramic bandswitch, Kokusai M.F., built-in solid state power supply, ant. relay, etc. All plugs, inst. manual and P.B. microphone supplied. Nothing else to buy. Cabinets beautifully lacquered in dark driftwood wrinkle. Satin finish panel £245 ($490).

As the above descriptions indicate, these equipments have every facility, enabling operation on the three modes without necessity for compromise. Fully imported. Used by Australia's leading phone DX'er.

Fully descriptive illustrated brochure available from the Australian agents:

BAIL ELECTRONIC SERVICES

60 SHANNON STREET, BOX HILL NORTH, VIC. Phone 89-2213

University OHMETERS

Model E13 Blasting Circuit Tester is housed in a hard rubber moulded case measuring 6½in x 4¾in x 2¾in with sufficient resiliency to withstand hard shocks and is unbreakable. Two basic ranges are provided 1-15 ohms in red and 0/300 ohms in black, both ranges operating from 1.5 Volt 950 type cell with a maximum current flow on the circuit of under 14 milliamperes thereby ensuring operation conditions considerably better than permitted safety margin, when testing detonator circuits. Knife edge terminals are fitted to the top of the case so that quick contact of bare wires can be made.

The meter used in this Tester is Model R4, 4 inch heavy duty bakelite case easily readable scale of 3½" in length, and is protected from damage by the front protruding hood of the meter case. App. N.S.W. Mines Department.

Model EXT/2 is a portable self-contained Ohmeter which covers resistance reading in several ranges—0-20 ohms (2 ohms centre) 0-500 ohms (20 ohms centre) 0-5000 ohms (200 ohms centre) and on the lowest range of 0-20 ohms the first graduation is 0.1 ohms. The case of Model EXT/2 Ohmeter is of hard moulded rubber similar to that used in the Model E13, and incorporates the use of Model W4, 4 inch square meter, heavy duty acrylic case with easily readable scale of 3½ inches in length. Test Leads are stowed away in the plastic holder on the carrying strap for portability and a zero adjuster compensates for variations in voltage due to ageing of the 1.5 Volt type 950 dry cell which is easily replaceable by removing the hard rubber moulded back. With normal useage this battery should last from 6 to 9 months.

UNIVERSITY GRAHAM

106 BELMORE ROAD, RIVERWOOD, N.S.W.
Telephones: 53-0644 (5 lines)
Telegraphic Address: "Raquip," Sydney

REPRESENTATIVES:

W.A.: Atkins (W.A.) Ltd.,
894 Hay Street, Perth, W.A.
S.A.: George Procter,
52 Gawler Place, Adelaide, S.A.
VIC.: Eastern Instrument Services Pty. Ltd.,
38 Milton Parade, Malvern, SE4.

QLD.: Keith Percy & Co. Pty. Ltd.,
Box 1478V, G.P.O., Brisbane, Qld.
TAS.: W. P. Martin and Company,
188 Collins Street Hobart,
and 134 Cambridge Street,
Launceston.

AUSTRALIA'S LEADING MANUFACTURER OF ELECTRICAL INSTRUMENTS (A UNIT OF INSTROL)

EA

AMATEUR BAND NEWS AND NOTES

The Amateur Advisory Committee

Probably the best known but sometimes the least appreciated body associated with amateur radio in Australia in the Amateur Advisory Committee.

By Pierce Healy, VK2APQ

An Amateur Advisory Committee under the control of the Postmaster-General's Department exists in each State of the Commonwealth of Australia. The sole object of its activities is the establishment of satisfactory operating conditions on the amateur frequency bands for the benefit of all amateur station licensees. Its function is of an advisory rather than a disciplinary nature.

By far the greater percentage of amateurs never have any dealings with the committee. However the thought has been expressed that because of the lack of knowledge of the functions of the committee, some fail to realise that, without such a body, many practices or incidents harmful to the amateur service could only be dealt with by official action.

The purpose and function of the committee is not as well known among amateur radio operators as it should be, and it has been said that the work of the committee is often unjustly criticised without serious thought on the part of a few.

The official rules relating to the operation of the Amateur Advisory Committee as laid down by the Postmaster-General's Department, Radio Branch, are usually only available to members of the committee and the Wireless Institute of Australia, so their circulation has been somewhat limited.

After discussing various aspects of the subject with the chairman of the New South Wales committee, senior officers of the Radio Branch agreed that a copy of the constitution relating to the committees should be made available for publication in these notes. This action will allow many more amateurs to be better informed on the subject than has previously been the case.

It is hoped that the following excerpts from the constitution will answer the questions being asked, particularly by those who have only in recent years obtained their amateur operator's license. It may help to clarify some of the comments and stories often heard in relation to the committee and enable a clearer assessment of the functions of the committee to be made. It may also eliminate the thought sometimes expressed, hat the committee's actions are those of a "Star Chamber" type of organisation. This outlook is refuted by its members and Institute officers who from time to time attend the meetings of the committee.

The president of the New South Wales Division, Ivan Agar, VK2AIM, who has attended such meetings says he has been very favourably impressed with the way in which reports of transgressions by amateur operators are dealt with, the amateur always being given the benefit of any doubt.

INTRODUCTION: "Amateur Advisory Committees were instituted to provide a "Self Policing" arrangement for Amateur tation licensees with the object of securing dherence to the Regulations which are deigned to ensure the orderly conduct of operations and maintenance of the highest racticable standards of transmission within requency bands allocated to the amateur ervice.

"The department has always refrained rom taking disciplinary action where other, or less forceful, measures could be applied. It was for this reason that, on September 1st, 1936, Vigilance Committees were formed in each State capital city. These committees functioned until the cessation of amateur station activities consequent upon the outbreak of war in 1939. Excellent service was rendered by members, collectively and individually, and resulted in considerable improvement in the standard of transmissions and operating procedure.

CONSTITUTION: "Each committee consists of a radio inspector as chairman, and at least three members, respectively, from the ranks of the Wireless Institute of Australia and Amateur Station Licensees not connected with that organisation. Where sufficient members are not available, the number may be reduced to meet the circumstances.

"In addition to ordinary members, selected licensees may be appointed as observers in certain country centres at the discretion of the chairman.

"All members of the committee, except the chairman, will serve for a term of 12 months ending Deceber 31st· The chairman originally appointed will retain his position except during periods of relief or in other circumstances which the exigencies of the branch might dictate, at the discretion of the Superintendent, Radio Branch.

Our contributor Pierce Healy. News and notes of divisional and club activities, submitted for inclusion in these columns, should be forwarded direct to Pierce, whose address is 69 Taylor Street, Bankstown, N.S.W.

"Nominations in respect of members of the Wireless Institute of Australia should be submitted to the Superintendent, Radio Branch, by the Institute.

(a) upon retirement of a member during the currency of a term; and

(b) at least fourteen days prior to the completion of the term ending December 31st in each year.

"Members retiring on completion of a term may be nominated for reappointment at the discretion of the Institute. Selection of the required number for appointment will made by the Superintendent, Radio Branch, whose decision shall be final. A request for the submission of nominations in connection with the annual election will be forwarded to the Wireless Institute of Australia by the Superintendent, Radio Branch, at least 30 days prior to the end of the term.

"Appointments to fill vacancies caused by the retirement of Advisory Committee members who are not also members of the Wireless Institute of Australia will be recommended by the chairman for the approval of the Superintendent, Radio Branch.

"The chairman may, where a member's service is unsatisfactory, recommend to the Superintendent, Radio Branch, the cancellation of his appointment. In the case of Institute nominees, the Superintendent will refer the matter to the Institute before giving effect to the recommendation.

MEETINGS: "Meetings will be held normally once each month at the convenience of individual committees. In certain circumstances it may be necessary to hold a special meeting or to waive or defer a monthly meeting. This should be done at the discretion of the chairman, who will convene all meetings.

"The chairman will normally preside at all meetings of the Committee. In his absence, the officer of the Radio Branch performing his duties will act in his stead.

"A report on all business transacted at each meeting will be submitted to the Superintendent, Radio Branch, and should contain any recommendations on matters coming within the scope of the committee's function.

OPERATION: "The functions of the Advisory Committee are:—

(a) to ascertain by observation and/or other means, short of inspection of the station, particulars of transmissions in the amateur bands and to log amateur stations whose transmissions are conducted contrary to the Wireless Telegraphy Regulations and Departmental Insructions;

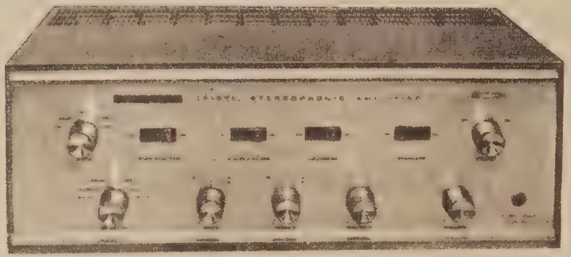
(b) with the authority of the department, to issue a notice or notices to the licensee concerned following the observation of a contravention or breach; and

(c) to supply the department with full particulars where notices have been ignored or where a breach is considered sufficiently serious as to be beyond the Committee's jurisdiction.

"The chairman will take no action as a member of the committee to discipline licensees guilty of breaches of Regulations and Instructions. All cases requiring official attention must be submitted to the Superintendent, Radio Branch.

"Though the primary aim of the Committee is to ensure maintenance of discipline amongst amateur station licensees, it is not desired that any disciplinary action should be undertaken by members of the committee or that they should harass licensees in any way. There is no objection, however, to any member of the Committee giving friendly advice to any licensee where it is

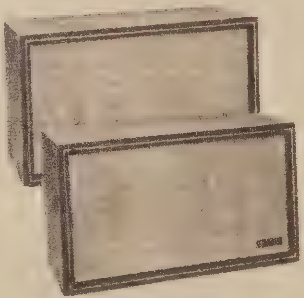
LAFAYETTE ***Newest Stereo Hi-Fi Amplifiers & Speaker Systems***



LAFAYETTE 70-WATT STEREO AMPLIFIER MODEL LA-350

● Six Pairs of Stereo Inputs for All Sources. ● Hansome Extruded Aluminium Front Panel ● DC On Preamp Filaments For Minimum Hum. ● Frequency Response plus or minus 1dB 15 to 30,000 cps. ● Harmonic Distortion Less Than 1 Per Cent.

De Luxe Lafayette LA-350 .... £99/15/, $199.50



New Deluxe Lafayette "Criterion 200" 3-Speaker 3-Way System

● Bass Reflex Design of Solid Wood Construction finished in Hand-rubbed Oiled Walnut Veneer. ● Power Handling Capacity 40 Watts. ● Response 25 to 25,000 cps. ● 12in Woofer with 2½in diameter Voice Coil. ● 3in Dome-type "Super" Tweeter. ● 8in Closed-back Midrange Unit. ● Size 24" W x 14" H x 12"D.

Criterion 200. . Ea. £54/15/, $109.50

Exciting Lafayette "CRITERION XL-360" MULTI-DIMENSIONAL 5-SPEAKER SYSTEM

Enjoy the thrilling experience of multi-dimensional "all-around" sound. Sit anywhere . . . Hear everything, glorious true-to-life sound. 360-degree sound dispersion over entire range 32 to 20,000 cps.
● Power Handling Capacity 20 Watts. ● Four 6" x 3" Mid-range Speakers with Ultra-High Frequency Metallic Cone Tweeter. ● 8" High Compliance Woofer. ● Size 32½"H x 11½"D x 11½". ● Genuine Walnut Veneer Oil Finshed.

Criterion XL-360 . . Each £44/15/-, $89.50

Lafayette 40-Watt Solid State Stereo Amp. LA-340

● Complete Stereophonic Control Facilities. ● Cool Running, Reliable Transistor Circuitry. ● Response plus or minus 1db 30 to 20,000 cps. ● Compact size.

Lafayette LA-340
£79/15/, $159.50

SEND REMITTANCE WITH ORDER FOR IMMEDIATE DELIVERY ANYWHERE OR WRITE, PHONE OR CALL FOR DETAILED INFORMATION.

LAFAYETTE ELECTRONICS
Division of Electron Tube Distributors Pty. Ltd.

All Mail Inquiries and Orders to:

VICTORIAN SALES CENTRE
AND HEAD OFFICE,
15A WELLINGTON STREET
WINDSOR, S.1, VIC., 51-6362.

See the LAFAYETTE range of Electronic Equipment also at:

ELECTRON TUBE DISTRIBUTORS PTY. LTD., 523 Old South Head Rd., Rose Bay, N.S.W. Phone 37-6472.

TISCO AGENCIES, Overend and Hampton Streets, Woollongabba, Q'land.

MACK'S ELECTRONICS, 199 Rundle Street, Adelaide, S.A.

WINDSOR SERVICES, Smith Street, Darwin, N.T.

considered such would be desirable. The advice may be given by letter, personal visit or radio contact. In the last eventuality, particulars should appear on the monthly report sheet submitted by the observer, and in all other cases, details must be submitted at the following meeting of the committee."

Other clauses in the constitution deal with the use by members of the committee and observers, of the specified report forms, the duty of the chairman to maintain report files and requirement for retiring members to return all unused stationery. Standard Pro Forma are used in all communications to amateurs from the committee. Pro Forma B is used to aquaint the operator of any irregularity noted in the operation of his station and, in addition to giving details of mode, frequency, date and time, requests a reply as soon as possible.

Pro Forma E refers to sub-standard transmissions from an amateur station and requests an early effort to effect an improvement. An offer of further information and advice if required is also given. Pro Forma C and F are sent if no reply is received in relation to Pro Forma B and E. Pro Forma D is sent when previous correspondence has been ignored or no effort has been made to eliminate the reported breach. It also informs the recipient that the matter has been referred to the Superintendent, Radio Branch, for official action

It has been said that laws are made to keep honest people honest. Maybe this statement can be applied to the Advisory Committee and might be the reason for comparatively few amateurs being on the receiving end of a "Pro Forma."

The policy of the Wireless Institute o Australia, in regard to the Advisory Committee, is to examine the rules from time to time, and, if considered necessary, to discuss the matter with Departmenta officers. In regard to the W.I.A. representatives on the Committee, they are at al times under the policy direction of thei Divisional Council.

It is emphasised by both the Departmental officers and W.I.A. representatives o the Committee that a reply to a Pro Forma sent out is essential. Even if the recipien considers that the incident reported is incorrect, a diplomatic suggestion to tha effect, coupled with the reply that the matte has been fully investigated, will generall finalise the matter.

W.I.A. Activities

Arrangements for the Federal Conventio to be held in Brisbane over Easter weeken have been finalised. The Council of th Queensland Division has extended an invitation to members of the Institute an their families who may be visiting th "Sunshine State" to attend the conventio and social functions that have been ar ranged.

A formidable agenda confronts the dele gates attending. In addition to the matter arising from the normal activities of th Institute and those associated with kindre societies and the Postmaster-General's Department, further discussion is schedule on the proposed new Federal Constitution

Probably the most contentious point t be resolved is the voting power of th Divisions. Two schools of thoughts exist o this matter, one is for the retention of th present system of one vote for each Stat Division, the other wants the voting right of a Division to be related to the numbe of members of a Division.

The purpose of the proposed constitutio is to strengthen the Federal body of th Institute and to enable several functions t be placed within the scope of the Feder body which is not possible under the present constitution which was formulated 1947.

The W.I.A. has received an invitation t send a representative to the Internation Amateur Radio Union Region 1 Conferenc to be held at the Hotel Kvarner, Opatij Yugoslavia, from the 23rd to 29th Ma

1966. Although this is desirable, funds are not available to send a delegate, however, should a member of the Institute be travelling through Europe during that period, and would like to attend the conference, letters of introduction will be arranged. Details should be sent to the Federal Secretary, Box 2611W, G.P.O., Melbourne.

NEW SOUTH WALES DIVISION

At the February General Meeting of the New South Wales Division, a plaque to perpetuate the memory of the late Wal Hannam VK2AXH, was presented to the Division by Peter Christie, on behalf of Wal's New Zealand Amateur friends.

Peter, a grand nephew of the late Wal, had just returned from a world tour, which was the award for being nominated as the youth of the year by the Lions Club International. He recalled some of the experiences related to him by his uncle and the great affection Wal had for New Zealand and his many friends.

Tape recorded greetings from the New Zealand amateurs responsible for arranging the gift were played.

Ivan Agar VK2AIM, president of the New South Wales Division, accepting the plaque on behalf of the Division, spoke of the work Wal had done in the early days of the Institute, as the first secretary of the Wireless Institute of N.S.W. later to become the W.I.A.

The plaque, made of assorted New Zealand timbers as a surround for a barometer, will be hung on the wall of the main meeting room of the Wireless Institute Centre at Crow's Nest.

The business of the meeting was devoted to consideration of the agenda items for the forthcoming Federal Convention and to a general discussion on matters relating to Institute activities at the federal level.

A.O.C.P. CLASSES

A limited number of vacancies exist in the A.O.C.P. classes conducted by the New South Wales Division of the W.I.A. This series of lectures on radio theory and P.M.G. Regulations, as well as tuition in sending and receiving of morse code, are designed to prepare students for the January, 1967, Amateur Operator's Certificate of Proficiency examination conducted by the Postmaster General's Department.

The classes are held each Tuesday and Thursday evening at the Wireless Institute Centre, 14 Atchison Street, Crow's Nest. A correspondence course is available for those unable to attend the classes. Full details can be obtained by writing to the Class Manager, W.I.C., 14 Atchison Street, Crow's Nest, N.S.W.

VHF and TV GROUP

Logs submitted for the New Year Field Contest Show that, as far as the field stations were concerned, the event was an outstanding success. However it was disappointing that more home stations did not participate.

The contest was won by Lance Phillips VK2ZKP and Bob Ridgely VK2ZAR, who operated from the "trig station" near Cassilis. Eddie Penikis VK1VP, operating from Mount Ginini near Canberra, was in second place.

The 144MC "Mobileer" project, a VHF transmitter and receiver, is proving to be popular. Three units are in operation and a further six are in the course of construction. Circuit and construction details are being prepared for publication.

CENTRAL COAST BRANCH

The Annual Field Day of the Central Coast Branch held at Gosford on Sunday, 27th February was very successful, with 140 licensed amateurs and their families and friends taking the total to about 300 enjoying the day. The contests included Hidden Transmitter Hunts, all-band scramble, quizzes, guessing competitions and best piece of home-built equipment. As usual, ladies associated with the Gosford club provided morning and afternoon teas and a hot lunch, which was enjoyed by hose attending.

The results and prize winners for the various contests were:—

All Band Scramble:
1st Dick Norman VK2ZCF
2nd Harold Burtoft VK2AAH
3rd Mac Hicks VK2ADV

First 144MC Transmitter Hunt:
1st Dave Andrews VK2AWZ
2nd Les Baber VK2RJ
3rd Max Francis VK2BMK

Second 144MC Transmitter Hunt:
1st Max Francis VK2BMK
2nd David Priestly Assoc.
3rd Paul Jackson VK2ZPJ

Receiver Sensitivity Test (7MC):
1st Don Soraghan VK2PU
2nd Harold Burtoft VK2AAH
3rd Vic Cole VK2VL

Best Piece Home-built Equipment:
1st Ken Mitchell VK2ANU
2nd Jim Cowan VK2ZC

At the conclusion of the day's activities, which included a scenic bus tour and a launch trip on the Brisbane Water, the presentation of prizes was made by Ivan Agar VK2AIM, N.S.W. Division president.

Prizes were donated by Mullard Aust., Hallicrafters, Ducon, Collins Radio, A.W.V., Philips and International Resistance. Several private donations came from club members.

The president of the Central Coast Branch, Ernie Hodgkins VK2EH expressed his pleasure at seeing so many visitors from Sydney, Newcastle and places even further afield and thanked the members who worked to make the event so successful.

NORTH-WEST ZONE CONVENTION

The first North-West Zone Convention and Field Day was held at Tamworth on January 29 and 30. Due to the co-operation and organisation of the Tamworth amateurs the event was a great success. The activities commenced on Saturday with tours of inspection to the studios of TV station NEN 9 and broadcast station 2TM, followed by an inspection of the Department of Civil Aviation installation at the control tower at Tamworth aerodrome.

The convention dinner on Saturday evening was attended by 36 amateurs and their friends. A toast to the W.I.A., proposed by Ray Carter, VK2HC, was replied to on behalf of the VK2 Division by Frank Pearson, VK2ACQ. The toast to the visitors proposed by Brian Burton, VK2AUN, was replied to by Keith Howard, VK2AKX.

The guest speaker for the evening was Lionel Todd, VK2LS, who spoke of his experiences in the early days of amateur radio. Lionel was the first licensed amateur in Tamworth in the mid-1920s.

On the Sunday about 50 amateurs and visitors from all parts of the zone as well as from Sydney and Newcastle were in attendance. Morning and afternoon refreshments were served, with ice-creams and soft drinks for the children and 807s for the operators. The main activities of the day were the mobile scramble and hidden transmitter hunts, and quizzes for those interested in testing their knowledge of various subjects.

The prize winners were:—

Mobile Scramble:
VHF Section: Tony Mullen, VK2ZCT.
HF Section: Dave Wheaton, VK2AWW.
40-metre Hidden Transmitter Hunt:
Dave Wheaton, VK2AWW.
1st 144MC Hidden Transmitter Hunt for pedestrians:
David MacNaughton, VK2ZVW.
2nd 144MC Hidden Transmitter Hunt for Pedestrians:
Phil Irvine, VK2ZPI.
Radio Quiz: Keith Howard, VK2AKX.
Ladies' Quiz: Sue Irvine.
Mystery Voices: Tas McLaughlin, VK2GV.
Ladies' Lucky Number: Pam Sinclair (XYL (VK2ZCV).

BRIGHT STAR CRYSTALS

FOR ACCURACY, STABILITY, ACTIVITY AND OUTPUT

Our crystals cover all types and frequencies in common use and include overtone plated and vacuum mounted. Holders include the following: DC11., F.T. 243., H.C.—6U., CRA., B7G., OCTAL, HC-18U.

5.5 5.5MC TV Sweep Generator Crystals.
£3/12/6 ($7.25) plus 12½ p.c. sales tax
100 KCS and 1000 KCS. Frequencies Standard.
Crystals £8/10/ ($17.00) each plus 12½ p.c. sales tax.

AUDIO ULTRASONIC AND SPECIAL CRYSTALS
PRICES ON APPLICATION.

The following fishing craft frequencies are available in F.T. 243 holders:
6280, 4095, 4535, 2760, 2524, 2182, 4620, etc.
Immediate delivery available for all above types.

AMATEUR TYPE CRYSTAL 3.5 and 7 MC BAND
Commercials — from £3/12/6 ($7.25) each plus 12½ per cent sales tax.
Amateur — from £3/-/- ($6.00) each plus 12½ per cent sales tax.
Regrinds 37/6 ($3.75) each
Crystals for Taxi and Bush Fire Sets also Available.
We would be very happy to advise and quote.

Representatives Aust. and New Zealand—Messrs. Carrel & Carrel, Box 2102, Auckland

Messrs Atkins (W.A.) Ltd.,
894 Hay St., PERTH.

Messrs. A. E. Harrold Pty. Ltd.
123-125 Charlotte St.,
BRISBANE

Messrs. United Radio Distributors Pty. Ltd.,
175 Phillip St., SYDNEY.

Messrs Lawrence and Hanson Electrical (Vic.) Pty. Ltd.,
56 Collins St., HOBART and
29 St. John St., LAUNCESTON
Tasmania.

"Contractors to Federal and State Government Departments."

BRIGHT STAR RADIO
46 Eastgate St., Oakleigh, S.E. 12, Vic. 57-6387
WITH THE CO-OPERATION OF OUR OVERSEAS ASSOCIATES OUR CRYSTAL MANUFACTURING METHODS ARE THE LATEST.

CRYSTAL PYE DIVISION

Manufacturers of Quartz Crystals for Frequency Control and Crystal Filters for Highly Selective Circuits, Announce:—

NEW LOWER PRICES FOR CLOSE TOLERANCE GOLD PLATED CRYSTALS FOR AMATEUR APPLICATIONS

- 1.8 Mc/s to 14.999 Mc/s ± 0.005% in Style "D" holders, ½in pin spacing. **Amateur net £2/8/6 each including tax.**
- 15 Mc/s to 47.999 Mc/s ± 0.005% in Style "D" holders, ½in pin spacing. **Amateur net £2/10/6 each including tax.**
- 48.0 Mc/s to 61.0 Mc/s ± 0.005% in Style "D" holders, ½in pin spacing. **Amateur net £2/16/3 each including tax.**
- 100 Kc/s ± 0.005% in HC13/U holders, ½in pin spacing* **Amateur net £4/10- each including tax.**
- 1 Mc/s ±0.005% in Style "D" holders, ½in pin spacings* **Amateur net £4/10/- each including tax.**
- 455 Kc/s nominal Crystals for Filter applications in Style "D" or "E" (B7G) holders. **Amateur net £4/10/- each including tax.**

* Specially designed for Crystal Calibrator purposes.

Many other types and tolerances are available from our standard production. Please consult us on your Crystal requirements.

PYE PTY. LTD.
CRYSTAL DIVISION
Clarinda Road, Clayton, Victoria. P.O. Box 105, Clayton. Tel.: 544-0361.
State Offices in Adelaide, Brisbane, Hobart, Perth and Sydney.

Be Paid What You are REALLY WORTH! $

Develop your aptitudes at your own pace, for recognition that brings HIGHER PAY. Begin YOUR Progress Today! Select the course you want and which will benefit you most. ICS will send YOU promptly — a FREE illustrated BOOK, giving FULL DETAILS.

GENERAL
Journalism — Short Stories
Writing for Radio & TV
Interior Decorating
Etiquette & Entertaining
Textiles
Photography
Mathematics
General Education
Dressmaking
DRAUGHTSMANSHIP
Architectural
Builders' Plan Drawing
Mechanical Structural
Surveying & Mapping
ILLUSTRATING
Still Life — Landscape
Caricature & Cartoons
Oil & Water Colour.
Fashion Drawing
Showcards & Tickets
Signwriting
COMMERCIAL
Accountancy
Cost Accountancy
General Bookkeeping
Salesmanship
Shorthand Typing
Retail Management
Commercial Managem't
Small Business Owners
Hotel-Motel Management
Club Administration
Window Dressing
Business Letters
BUILDING
Architecture
Building Contracting
Carpentry, Joinery
Structural Engineering
Concrete Engineering
Estimate & Quantities
Roofing, Steel Square
Timber Home Building
INDUSTRIAL
All Mechanical Eng.
Fitting & Turning
Soft Drink Manufacture
Air Conditioning
Gas or Elect. Welding
Chemistry, Plastics
Electronics
Electrical Mechanics
Radio Eng. or Service
Television
Refrigeration
Diesel Engines
Auto Mechanics
Civil Engineer
Production Managem't
Industrial Management
Executive Training
Modern Supervision
SPECIAL EXAMINATION COACHING COURSES
Account'cy: All Exams
Institute of Secretaries
Inst. Cost Accountants
Inst. Sales & Marketing.
Matric. or Leav. Cert.
Intermediate Certificate
Senior or Junior Public
C'wealth Clerical Exams
Police Entrance Exam
Nurses' Entrance Exam
Steam Certificate
Refrigeration Certificate
Radio Examinations
Inst. Auto. Mech. Engrs.
Inst. Diesel Engineers
Shire Overseers' Exam
Engineers' Institutions.
ADVERTISING
Copywriting
Commercial Art
Advert'g Inst. Aust.

TO **INTERNATIONAL CORRESPONDENCE**
Dept. 526 SCHOOLS,
SYDNEY: 400 Pacific H'way, Crow's Nest. Tele.: 43-2121.
MELBOURNE: 234 Collins Street. Tele.: 63-7327.
BRISBANE: Heindorff House, 171 Queen St., Brisbane. Tele.: 2-6125.
ADELAIDE: T. & G. Building, King William St. Tele.: W-4148.
PERTH: C'wealth Bank Building, 55 William St. Tele.: 21-7268.
NEW ZEALAND: Wellington, 182 Wakefield St. Tele.: 53-109.

Please send Free Book on ....
NAME (Mr, Mrs, Miss) .... AGE ....
ADDRESS ....
.... STATE .... Dept. 526
OCCUPATION .... PHONE ....
EA-4-66

Acknowledgment and thanks for donations of prizes and/or literature is extended to Mullard-Australia; Lawrence and Hansen; Philips Electrical; Ducon; A.W.V.; Delco; Pye Crystals; VK2RJ and VK2BAE. The presentation of prizes was made by the late Frank Pearson, VK2ACQ.

A report on the convention has been received from the North-West Zone Officer, Max Francis, VK2BMK, in which he expressed his thanks to those attending and making the event a success, and extended an invitation to attend next year. He also thanked Bill Sinclair, VK2ZCV, Noel Taylor, VK2ASQ, Brian Burton, VK2AUN, and Les Baber, VK2RJ, for the work they did in organising the convention.

CANBERRA RADIO SOCIETY

The Canberra Radio Society extends an invitation to attend its annual convention to be held over the Easter holiday period, April 8 to 11 inclusive. The organisers state that Canberra offers all the facilities for a convention-with-a-difference. You can have amateur radio events, top-interest scientific visits and tourism for all the family, mixed in any proportion.

A full program has been arranged, commencing with a mobile contest on Friday, for the greatest number of contacts on one band in any four consecutive hours. The rendezvous for registration and evening functions on Friday and Sunday, and the starting point for several transmitter hunts, will be the club rooms, VK1ACA, Riverside Centre, Canberra. At the Canberra Rex Hotel on Saturday evening, commencing at 8pm, the convention dinner will be held. Those attending are invited to cocktails at 7.30pm.

On Saturday morning there will be a visit to the Tidbinbilla Space Tracking station, followed by a picnic lunch at the Cotter Dam picnic reserve. During the afternoon 7MC and 144MC hidden transmitter hunts will be conducted, also a receiver sensitivity contest.

A visit to the Australian National University Nuclear Physics Department has been arranged for Sunday morning, and a visit to the Mount Stromlo Observatory in the afternoon. There will be an all-band scramble conducted between 1.45pm and 2.45pm; at 4pm a 144MC hidden transmitter hunt; and at 5pm a 7MC hidden transmitter hunt.

On Sunday evening at the club rooms, commencing at 7.30pm, films will be shown, followed by the presentation of prizes and a white elephant sale of equipment. The convention program will conclude on Monday morning with a visit to the Belconnen Naval Transmitting site. Registration fee for the convention is $1 (10/) for the family.

VICTORIA

The 1966 State Convention of the Victorian Division will be held at Ararat on April 23 and 24. This is a long weekend as Monday, April 25, is a public holiday and will allow many people extra travelling time to attend the event.

The location of the Saturday activities will be the V.R.I. Building in High Street, Ararat. During the afternoon there will be registration of members and a demonstration of commercially built amateur band equipment. On Saturday evening there will be a four-course dinner, after which the ladies will adjourn for a showing of selected films while the business meeting is held. Supper will be served later in the evening.

Sunday activities will be at the Mount Mistake picnic ground. These activities will consist of 3.5MC and 7MC scrambles, the VHF hidden transmitter hunt and a barbecue lunch. In the afternoon the 3.5MC transmitter hunt will be held and also a 144MC FM car trial.

Cost of the dinner and supper on Saturday will be $2 (£1) per head and the cost of the barbecue lunch on the Sunday is $1.00 (10/).For children under 14 years of age 50c.

Those who require accommodation should

contact Neil Glanville, VK3AQD, 1 Speed Street, Ararat.

SOUTH AUSTRALIA

Official approval has been given for the South Australian Division of the W.I.A. to install and maintain an unattended beacon transmitter operating in the 52MC and 144MC amateur bands. A stipulation in granting this facility was that arrangements acceptable to the P.M.G.'s Department be made for the prompt termination of transmissions at the request of an officer of the Radio Branch, should the necessity arise.

This approval followed an approach to the P.M.G.'s Department by Federal Executive, on behalf of the South Australian Division, whose members prepared the technical data and other information for the construction and the reasons for the establishment of VHF beacon stations.

QUEENSLAND

Notice was given in the February issue of the Queensland Division Bulletin, "QTC," of the Annual General Meeting to be held on Friday, April 22nd. The meeting will commence at 8 p.m. and will be held in the Institute of Social Services, Berwick Street, Fortitude Valley, Brisbane.

For those wishing to obtain their amateur license, A.O.C.P. Classes are held each Wednesday night at 8 p.m. in the Institute of Social Services, Berwick Street, Fortitude Valley, Brisbane. Full details can be obtained by writing to the Class Manager, W.I.A., Box 638J, G.P.O. Brisbane.

WEST AUSTRALIA

Roy Chamberlain, VK6RY, has been reappointed unopposed as Federal Councillor for the West Australian Division and will represent the Division at the Federal Convention to be held in Brisbane at Easter. This will be Roy's third term of office.

The February membership figures of the Division now stand at 267, an increase of 48 since May 1965. Applications for membership should be addressed to: Hon. Secretary. W.I.A., Box N1002, G.P.O. Perth.

144MC DX

The February issue of these notes gave details of the 144MC DX opening between New Zealand and South Australia. This was followed in the March issue by a list of contacts made across the Tasman Sea from November 27, 1965 to January 2, 1966. This list, showed that contacts had been made between VK5 and ZL2 stations. This fact has been confirmed in a letter from Hugh Lloyd VK5BC who earlier supplied details of his two-way contact with ZL 3AAD

Hugh writes: "Following the opening to ZL3AAD on December 9th, nothing further occurred until Thursday, December 23rd, when a terrific opening to ZL2 district took place on 144MC.

"This opening was similar to the previous one to ZL3 inasmuch as the New Zealand station's signals on 52MC were rock solid, which would appear to make the openings on 144MC attributable to Sporadic E conditions.

"The 144MC band opening commenced around 1700 hours South Australian time. The first contact was made with ZL2TCW followed by contacts with ZL2CD, ZL2HP, ZL2ACB, ZL2AJB, ZL2AAH, ZL2AGD and ZL2MF. ZL's 2HP, 2MF and 2AAH were worked on both CW and phone. Most of the signals were around strength 7 to 8 with some QSB.

"Weather conditions preceding the opening were very hot and humid with approaching thunderstorm, plus a wind change. The temperature at Renmark was 104 degrees.

"This was a terrific opening, lasting from 1700 hours to 1830 hours, differing from the opening to ZL3AAD inasmuch as the band was very quiet and the signals just appeared to be fading in and out."

The contacts listed between ZL3 call area and VK7 on December 13th have been confirmed in a letter received from Winston Henry VK7ZAP who wrote:

"On December 13th 1965, I worked the following stations on 144MC.

SIGNAL REPORTS

Time EST	Station worked	Sent	Received
1745	ZL3UM	R5-S9	R5-S9
1750	ZL3AR	R5-S9	R5-S6
1754	ZL3AT	R5-S8	R5-S8
1802	ZL3AU	R5-S8	R5-S8

"Signals were so strong at 1745 Hours EST that they were peaking well over strength 9 with the beam pointing north. After swinging the beam on New Zealand, ZL3UM was so strong that even the QSB was not taking the signal below Strength

"Signals slowly deteriorated until they disappeared at 1815 Hours EST. Two other ZL3 Stations were heard between 1800-1815 Hours EST but due to a modulator failure at 1804 Hours I was not able to make the contacts.

"At the time of the opening the 52MC band was open to VK1; VK2; VK3; VK4 and VK5. Several of the VK7 stations operating on the 53.035MC AM net were working mobile to mobile with VK3 stations in Melbourne with signals Readibility 5 Strength 9 each way."

Winston also gave details of a good "Tropospheric" 144MC opening to Victoria on January 8th, 9th and 10th 1966.

January 8, 1966 worked—

2153 Hours EST, VK3ZDM. Sent R5-S6. Received R5-S4. 2315 Hours EST VK3ZNC. Sent R4-S4. Received R3-S4.

January 9, 1966—

0700 Hours EST, VK3ZDM. Sent R5-S9. Received R5-S9.

January 9th and 10th, 1966—

Heard VK3ALZ at good signal strength up to S8 at times.

The equipment used by VK7ZAP at his station located 1000 feet above sea level at Mount Nelson three-and-one-half miles south of Hobart is:

Transmitter 90 watts input to a QQE06/40, modulator Class "B" 6146's.

Receiver 417(A)—E88CC—E80CF converter into a G.E.C. BRT 400d.

Winston also gave some interesting details of reception of TV stations in Hobart which should be of interest to VHF operators in New South Wales.

"On Friday January 18, between 10 p.m. and 0030 a.m. Saturday, Channels 7 and 9 were received in Hobart. These sightings have been confirmed by the program schedules. The signals from ATN7 and TCN9 in Sydney were fading between HSV7 and GTV9 in Melbourne, with the Melbourne stations being considerably stronger than the Sydney stations.

"However, the signals were strong enough to provide a strong co-channel 10KC heterodyne for about two-and-one-half hours. The significance in this is that on each occasion that the VK3 144MC stations were heard, Melbourne TV stations were received. This could indicate the possibility of VK7 to VK2 'tropospheric' openings on 144MC. Regular monitoring of the TV channels is being done to see how often these openings might be."

There appears little room for doubt that VHF operators are looking forward to the end of 1966 so that further tests, associated with the VHF propagation conditions that exist during the summer months, can be made.

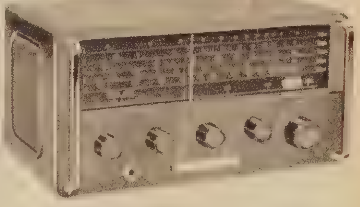
It has been said that the most likely way to set a new Australasian 144MC DX record is across Australia. Maybe 1966-67 will see a number of VK2 stations operating from mountain top locations with beams pointing west rather than towards New Zealand in the hope that they can regain the DX title from VK5.

TV DX RECEPTION

The industrial strike in Victoria early in February had an interesting sidelight as far as television reception was concerned. During that period TV stations in Melbourne had their hours of transmission severely curtailed. However, around 7 p.m. on Feb-

EDDYSTONE

COMMUNICATIONS RECEIVER



MODEL EC10

550 kc/s to 30 Mc/s

TRANSISTORISED

The Eddystone Model "EC10" is a fully transistorised communications receiver of reasonably small size and giving an excellent performance over the range 550 kc/s to 30 Mc/s, covered in five bands and without any break. The receiver accepts CW and AM signals and, although not designed specifically for reception of SSB, it operates well in this mode also. Power is derived from dry cells housed in a box within the cabinet and easily changed when required. A speaker is fitted and the receiver is self contained other than for an aerial, the input connections allowing the use of different types, including a short rod or whip.

Frequency Coverage

Range 1 18.0 Mc/s to 30.0 Mc/s
Range 2 8.5 Mc/s to 18.0 Mc/s
Range 3 3.5 Mc/s to 8.5 Mc/s
Range 4 1.5 Mc/s to 3.5 Mc/s
Range 5 550 kc/s to 1500 kc/s

A brochure is available upon request. Now available ex stock.

Price: $191.98 plus sales tax $48.00

AUSTRALIAN AGENTS
R.H. Cunningham PTY. LTD.

VIC.: 8 Bromham Place, Richmond—42-1614.
N.S.W.: 64 Alfred St., Milson's Point — 929-8066.
QLD.: L. E. Boughen & Co., 95 Central Ave, Sherwood—79-2207.
W.A.: H. J. McQuillan Pty. Ltd., 1017 Welling St., Perth—21-8911.

Sure Brite Picture Tubes

ALL TYPES OF TUBES AVAILABLE EXCEPT BONDED

Year Warranty
$10 plus dud

2 Year Warranty
$12 plus dud

Test tubes
$8 (see below)

27 inch $20 plus dud
All prices cash or COD

THESE ARE
TRADE PRICES

FULL WARRANTY:
Any tube returned to Sure Brite under warranty is replaced with another one at no extra charge, regardless of whether it tests good or not, so long as it is not broken.

COUNTRY CUSTOMERS
Rail tubes to Lewisham Station, freight paid. Orders filled same day received. All freight charges to be paid by customer.

LARGE STOCK
We always have 200 to 400 tubes in stock. All Australian types except bonded. When ordering state which price tube you want, otherwise the $12 tube will be supplied.

DELIVERY
Free delivery on tubes Mon. Wed. Fri. inter suburbs only.

TEST TUBES
We have 5 inch 70-deg. type uses focus magnet and no ion trap, and 21 inch 110-deg (110-deg may have spots) $8 each, no dud required.

DUDS
Must be under vacuum and scratch free.
We can sell 17 inch without dud for $6 extra 21 inch without dud for $8 extra. 23" $10 extra.

BENT GUNS AND 12 VOLT
We have the sharper focus bent guns and can supply them in the popular 21 inch 90-deg., also any type can be supplied with 12 volt 300ma heater.

Sure Brite Picture Tubes

22A VICTORIA STREET, LEWISHAM, SYDNEY, N.S.W. PHONE 56-6363

Knowledge That Has Endured With The Pyramids

WHENCE came the knowledge that built the Pyramids and the mighty Temples of the Pharaohs? Civilization began in the Nile Valley centuries ago. Where did its first builders acquire their astounding wisdom that started man on his upward climb? Beginning with naught they overcame nature's forces and gave the world its first sciences and arts. Did their knowledge come from a race now submerged beneath the sea, or were they touched with Infinite inspiration? From what concealed source came the wisdom that produced such characters as Amenhotep IV, Leonardo da Vinci, Isaac Newton, and a host of others?

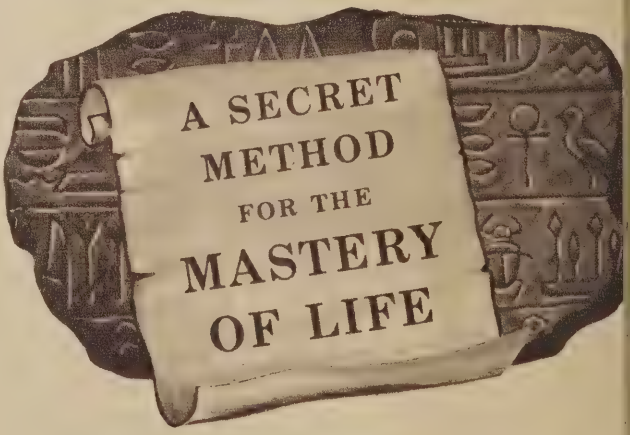
Today it is known that they discovered and learned to interpret certain *Secret Methods* for the development of their inner power of mind. They learned to command the inner forces within their own beings, and to master life. This secret art of living has been preserved and handed down throughout the ages. Today it is extended to those who dare to use its profound principles to meet and solve the problems of life in these complex times.

This Sealed Book—FREE

Has life brought you that personal satisfaction, the sense of achievement and happiness that you desire? If not, it is your duty to yourself to learn about this rational method of applying natural laws for the mastery of life. To the thoughtful person it is obvious that everyone cannot be entrusted with an intimate knowledge of the mysteries of life, for everyone is not capable of properly using it. But if you are one of those possessed of a true desire to forge ahead and wish to make use of the subtle influences of life, the Rosicrucians (not a religious organization) will send you a Sealed Book of explanation without obligation. This Sealed Book tells how you, in the privacy of your own home, without interference with your personal affairs or manner of living, may receive these secret teachings. Not weird or strange practices, but a rational application of the basic laws of life. To obtain your complimentary copy use the coupon below or address Scribe J.D.R.

The ROSICRUCIANS

(AMORC)
54 Customs St.. AUCKLAND, N.Z.



Use this coupon for FREE *copy of book*

AMENHOTEP IV
FOUNDER OF EGYPT'S
MYSTERY SCHOOL

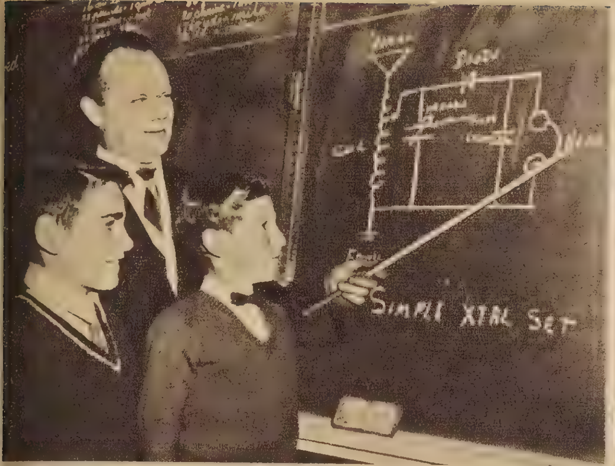
Scribe J.D.R.
The Rosicrucians (AMORC)
54 Customs St., AUCKLAND, N.Z.

Please send free copy of Sealed Book, which I shall read as directed.

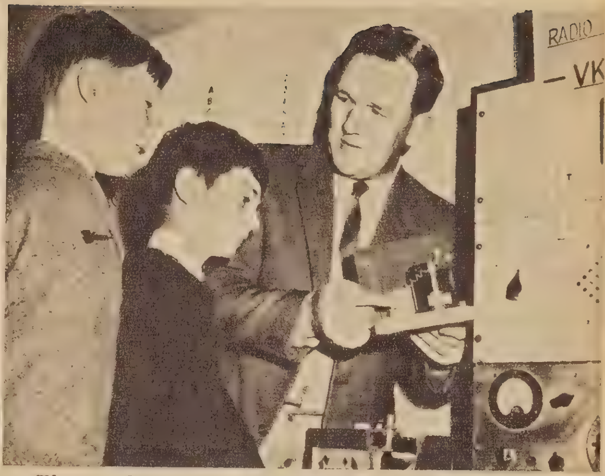
Name..........

Address..........

City..........



The only primary school in Australia with its own radio club is Gowrie Park State School, Victoria. Pictured are (left to right): Andon Todorov, W. Allen (club instructor) and Allen Joynson. Both boys have passed Elementary Certificate.



The two boys shown here recently passed Junior Certificate. Left to right: Frank Wrobel, David Hardiment and club instructor Harry Smith. Average age of club members is 12 years.

W.I.A. YOUTH RADIO SCHEME

With classes settling down following the commencement of a new school year, activity among the Y.R.S. Clubs is again increasing and already reports are coming to hand of good progress being made by students.

The outstanding achievement so early in the year is that of Gregory Dunne, a 16 year old student of the Kingsgrove High School, in the south-western suburbs of Sydney. By passing the fourth level of the Basic Series of awards, involving six constructional projects and two written examination papers, each of two hours and each requiring five questions to be answered out of eight, he became the very first successful candidate to gain the Senior Radio Certificate of the Youth Radio Scheme.

After passing the School Certificate at the end of 1965, he was selected for training with the Department of Civil Aviation, but finally decided to continue at school for the fifth and sixth form and ultimate University course.

At the Marist Brothers High School, Pagewood, (South of Sydney) three students gained Honours, six gained Credit and four gained Pass Certificates in the Elementary Radio Certificate examination. The highest Honours pass (96 per cent) was gained by Gary Derbyshire, a Form 2A student, and has earned him the Overseas Telecommunications Commission prize. Gary has either been top or second in his Class since primary standard.

Most of the boys will go on to the Junior Radio Certificate shortly. About ten new Form 2 boys will join the Club and attempt the Elementary Certificate test in a few months time.

WESTLAKES RADIO CLUB

The Westlakes Radio Club concluded a very successful year in 1965 with 103 members, 67 of whom were Youth Radio Scheme members. During the year, awards of seven Elementary Certificates and four Junior Certificates were made to Y.R.S. members. Also, two members from the Club who gained the A.O.L.C.P. and one the A.O.C.P. are now active amateur operators.

The Executive officers of the Club for 1966 were elected at the meeting held on Wednesday, February 23. They are:—

President	Keith Howard	VK2AKX
Vice-President	Joe Waugh	Assoc.
Secretary	Wal Lean	Assoc.
Treasurer	Max McLachlan	Assoc.
Tech. Communication Officer	David Russell	VK2BSC
Morse Training Officer,	Bob Blyth	VK2BOB
Stores Officer	Ross Beckley	VK2ZKB

Committee Members:

Pat Maloney	VK2AXU
Henry Schroeder	VK2ZGK
Susan Brown	VK2BSB
Allan Legge	Assoc.

TV DX reception continued

ruary 9, a program from station TNT Channel 9 from Launceston, Tasmania was received in Melbourne. Reception was possible because station GTV Channel 9 in Melbourne was off the air. The Channel 9 frequency is 195MC-202MC and both stations use horizontal polarisation.

In a letter from T.D. Baker VK3DK of Sunshine, Victoria the following report was received:—

"On the evening of February 9, 1966, from 6.45 p.m. to 7.01 p.m. EST, pictures were received at this location, transmitted from TV station TNT at Launceston on 200MC.

"Sync pulses from the transmitter were controlling the receiver well but the noise evel was high until 6.55 p.m. when the picture became quite clear but lacked contrast. At 7.02 p.m. sync pulses were lost. Sound was only occasionally heard with a very high noise level.

"A commercial TV antenna was in use and was aimed broadly in a great circle path to Tasmania. The receiver is ten years old. The weather was clear and mild and it is thought that sporadic E conditions, and hot temperature inversion, were responsible for reception."

The letter concluded, "This UHF reception (accidental) brings back nostalgic memories as I was one of the pioneers of the 8MC band 29 years ago (1937), but am o longer active."

How many other pioneers of the then npredictable amateur bands have similar thoughts when modern components, techniques and services now so commonplace have eclipsed their achievements of several decades ago?.

GHOST PROJECT

Questionnaires distributed by the Commonwealth Bureau of Meteorology in connection with the Global Horizontal Sounding Techniques (Ghost) Project, should be sent without delay to the Bureau of Meteology, Box 1289K, G.P.O., Melbourne. This project, by the release of balloons carrying small radio transmitters from New Zealand, is designed to obtain atmospheric

(Continued on page 147)

A.R.R.L.

Asoc. Memberships (and renewals) are available by forewarding $5.40 ($5.45 interstate cheques)

to:—

Business Manager, W.I.A.
49 Cookson Street,
Camberwell, E6., Victoria.

This includes regular delivery of

"QST"

to your home address.

Selectronic Components MANFACTURERS ELECTRONIC ENGINEERS

PICTURE TUBE BRIGHTENERS

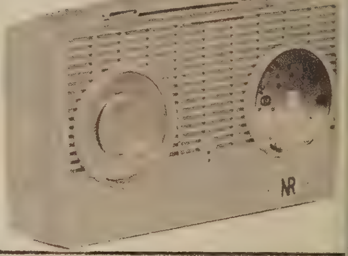
- Plug directly to picture tube base
- Taps at 7.5, 8.5, 9.5 volts ..
- Complete instructions for use. ..
- Individually boxed

MODEL PTB/5 (70 degs. & 90 degs.)
Trade $2.60 plus tax
MODEL PTB/6 (110 degs.)
Trade $2.80 plus tax
Available wholesalers all states. ..

6 CENTRAL AVENUE, BORONIA, VICTORIA. (72) 92233

Special Purchase of Manufacturer's stock of Transistors and Transistor Components enables us to offer Transistors and Kit-sets at a fraction of original cost.

Complete KIT for TRANSISTOR 6 PORTABLE $21.95



The complete kit of parts for the transistor six includes six transistors, printed circuit board, coil kit, 4in speaker, Ferguson driver and output transformers, heavy duty battery and all necessary parts to complete the set with full instructions. **Set is housed in attractive plastic case as illustrated.**

Dials available for all States. Post and Pack: extra. N.S.W., $1.00, Inter., $1.30.

NEW ENGLISH MAZDA TRANSISTORS

TYPE	EQUIVALENT		
XA101	OC45	R.F. Transistor	55c
XA102	OC44	Osc. Transistor	75c ea.
XB103	OC75	AUDIO general purpose	75c

Ducon type SFT 123 equiv. OC74 .. .. 75c ea.
Available in matched pairs at .. .. $1.50 pair
AUDIO OUTPUT
Post and packing on transistors 15c any quantity.

A.W.A. 23" E.H.T. transformers and 23" 110 deg. deflection yokes. New manufacturers stock E.H.T. units $5.00. Deflection yokes $5.00. Post free

NEW VALVES AT BARGAIN PRICES

1A7GT	95c	3S4	$1.00	6J5	75c	6SN7GT	95c	1L56	95c
1C7G	30c	5Y3GT	$1.25	6K7G	45c	6SS equiv. 6SK7.	85c	12A6	50c
1D8GT	95c	5V4G	$1.00	6K8G	68c	6U7G	45c	12SK7	50c
1K5G	40c	6B8	$1.00	6Q7G equiv, 6B6G	$1.00	6X5GT	75c	12SK8	50c
1K7G	49c	6C8G	50c	6SA7GT	95c	7C7	35c	12SH7	50c
1M5G	40c	6F6	$1.00	6SH7	55c	12AU7	$1.00	866	1.50
1P5G	25c	6H6	35c	6SJ7	95s	12AT7	$1.00	954	25c
1Q5G	25c							955	25c
1T4	45c							7193	25c
3Q4	75c							EK32	68c
EF50	45c							EL33	$1.00

Please add postage on all valves.

NEW 4-SPEED STEREO & MONO PLAYERS

AT LESS THAN HALF PRICE

PHILIPS 4-SPEED
6V BATTERY PLAYER
MONO $9.75
STEREO $11.75

Post and Packing, N.S.W., 75c.
Post and Packing, Inter., $1.25 Extra.

NEW 240V. ELECTRIC MOTORS

3300 R.P.M. can be supplied with or without 4-speed reduction mechanism. Size 3¼" x 2¾ x 3½, including spindle.

$2.75

NEW PORTABLE RECORD PLAYER CASES TO SUIT THE ABOVE TURNTABLE

$11.50

Attractive two-tone cabinet with plastic trim.
Supplied with 5in x 7in speaker in felt-lined enclosure
Space for amplifier and batteries or power supply.

Dimensions: 15in x 13in x 7in.
Post and Packing: N.S.W., 90c; Interstate, $1.20.

NEW MULTIMETER — $5.75

POST EXTRA
METER 0-1MA 1,000 OHMS PER VOLT
A.C. RANGES D.C. RANGES CURRENT
SUPPLIED COMPLETE WITH TEST LEAD
RANGE 0-100,000 OHMS

0—10v	0—100v	0—500v	0—500MA
0—50v	0—10v	0—1000v	
0—250v	0—50v	0—1MA	
0—500v	0—250v	0—100MA	

EXTENSION SPEAKERS

New 9 x 6 speakers in case with volume control, $7.50. Post: Interstate, 55c; N.S.W. 40c.

NEW POWER TRANSFORMERS

60mA prim.: 240v with 230v tapping Sec. 285 x 285 with 6.3v filament winding. 60mA, $2.50. Plus Postage: N.S.W., 35c; Interstate, 52c.

Prim.: 240v, Sec. 385 x 385 at 80mA, fil. 6.3 and 5v, $2.75. Post.: N.S.W., 40c; Interstate, 75c.

60mA H.T. Chokes, 75c. Post.: 20c.

SHOP-SOILED 60 M.A. TRANSFORMER

285 x 285
One 6.3 volt winding $1.50 each plus post. N.S.W. 50c, Interstate 60c.

P.M.G. PRESS TO TALK HAND SETS, $2.50 each.

Post and pack 30c.

NEW AMERICAN RECORDING TAPE

At ½ List Price

5¾in 900ft Acetate	$2.25
7in spool 1800ft Mylar	$4.25
5¾in spool 1100ft Acetate	$2.50
5in 800ft Mylar	$2.50

Post and packing 25c extra.

NEW MIDGET POWER TRANS.

40mA prim., 250v. Sec 225 x 225 with 6.3v Fil. Winding.

$2.75 Postage: N.S.W.., 25c; Interstate 45c.

30mA 240v Prim. 150 x 150v. Sec. with 6.3v Fil. Winding.

$2.75 Postage: N.S.W., 25c. Interstate 35c.

TRANSISTORISED SIGNAL INJECTOR, $5.5

A MUST FOR QUICK TROUBLE SHOOTING

Using TWO Transistors, complete with instruction sheet and battery. Post free

NEW PER-MAG SPEAKERS by Australia's leading Manufacturer

6in Per Mag	$3.50
3½in Per Mag	$2.25
5in Per Mag	$2.75
5in x 7in Per Mag	$3.25
Post and Pack, 35c N.S.W.; Inter., 45c.	
6in x 9in Per Mag	$3.75

3½in Per Mag Tweeter with Cross Over Condenser	$2.0
6in x 9in Per Mag Hvy. dty. 15 ohm	4.2
8in Per Mag.	$3.7
10in Per Mag.	$4.7
12in Per Mag	$6.7
12in Per Mag 20 watt	$13.5

Post and Pack, 50c N.S.W.; 75c Interstate.
12in Per Mag .. $6.75. Post and Packing, 75c N.S.W.; $1 Interstate.
Speaker Transformers for above 6T, 5T or 7T $1.00.

NATIONAL RADIO SUPPLIES

332 PARRAMATTA ROAD, STANMORE, N.S.W. PHONE 56-7398.

SPECIAL PURCHASE OF FACTORY STOCK

RESISTORS, CONDENSERS AND POTENTIOMETERS

We have purchased the resistor and condenser stock of manufacturers including S.T.C. and Stromberg-Carlson who have ceased the manufacture of television and radio receivers and can offer same at less than 25 per cent of list price.

The resistors are mainly I.R.C. and Morganite in values from 200 ohm. to 5 meg. in ½, 1 and 2 watt ratings and include some wire wound resistors. List price, $9.00 per 100. **Our price, $2.00 per 100.** Post and packing 25c extra.

The condensers are in most popular makes and include mica, ceramic, paper and electrolytic in standard values. List price, $11 per 100. **Our price, $2.06 per 100.** Post and packing, 35c extra.

The potentiometers are all current types and include switch pots, dual concentric and THB pots. List price, $12 per dozen. **Our price, $2.50 per dozen.** Post and packing, 25c extra.

FREE For a limited period with each lot of resistors, condensers or potentiometers purchased we will supply free: One New Valve Type 6U7G or IT4 as advertised on this page.

New English Miniature 11 x 1 Switches

These new miniature eleven-position single-bank switches are 1" diam. with ¼" spindle, they have silver-plated contacts and high quality insulation suitable for H.F. use.

48c each. Post and packing 15c.

NEW GARRARD RECORD CHANGERS

These New English Garrard Changers with High Fidelity Crystal Pick-ups and Sapphire Styli have just been superseded. We are selling same at LESS THAN HALF PRICE. Available in STEREO at $25.50. POST AND PACKING EXTRA N.S.W., $1.50; QLD., VIC., TAS., $2.25; WA., SA., $130.

HIGH-SPEED 240V. AC/DC MOTORS

These 240 v. a.c. or d.c. motors are 1/8 H.P. with a speed of 7.000 R.P.M. and are ideal for small drills, grinders, etc. Dimensions, 5½in x 3½in, with 5/16in spindle $3.75
Post, N.S.W., 50c; Interstate, 85c.

NEW 4-SPEED STEREO PLAYER F.O.R. .. $17.50 (£8/15/)

NEW STEREO CHANGER. 4-SPEED F.O.R. .. $21.50 (£10/15/)

SLIDER-SWITCHES
10 pole 2-way silver plated contacts 38c

TYGAN AND SARLON SPEAKER GRILLE FABRIC

54in wide. List price $6 per yard. To clear at $4 per yard.
Postage and packing, NS.W., 35c; Interstate, 45c.

LEADER SIGNAL GENERATOR LSG11

240V A.C. operated, 6 band 120KC to 390 Megs
Provision for crystal.
Post N.S.W., 75c; Interstate, $1.25. **$30.00**

BATTERY CHARGER RECTIFIERS

New Selenium Rectifiers, 6 or 12 volt, at 4 amp., $3.75. Post, N.S.W., 20c; Interstate, 20c. Transformer for above rectifier tapped for 6 to 12 volt, with circuit for charger, $4.75. Post, N.S.W., 75c.; Interstate $1.00
As above, 6 or 12 v., at 2 amp., $2.75. Post, N.S.W., 35c; Interstate, 45c. Transformer for above, $3.75. Post, N.SW., 35c; Interstate, 45c

NEW 240V. A.C. MOTORS

These small motors, size 5in x 3in x 3½in, are 1-12 h.p., but are only suitable for intermittent use. $2.95. Post N.S.W. 35c; Interstate 50c.

THE NEW COLLARO 3-SPEED TAPE-DECKS 2 & 4 TRACK

The ideal deck for the home constructor, as amplifier and all controls can be mounted on deck.

● 3-speed 1⅞, 3¾, 7½. ● Pause control. ● Takes 7in spools.
● Simplified controls, 4 Track, $48; 2 Track, $44. OSC Coils, $150.

NEW B.S.R. TAPE DECKS

These new 3-speed B.S.R. Decks are fitted with a digital counter and will take 7in spools.
2 Track, $35.50, 4 Track 45.25.

NEW IMPORTED "NATIONAL" TRANSISTOR SIX PORTABLES

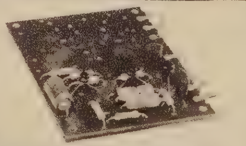
These small Portables, size 3½in x 2½in x 1¼in have excellent tone and good sensitivity. Selling at less than wholesale price.

$25.75 £12/17/6 (Post free)

Supplied with leather case and earphones.

A PREAMP FOR MAGNETIC PICK-UP OR TAPE HEADS

SUITABLE FOR USE WITH THE COLLARO OR B.S.R. TAPE DECKS



Using 3 silicon transistors as featured in October. Electronics Australia complete with kit of parts including transistors mono **$7.50**, stereo **$11.00**, 240 power supply for above **$7.00.**

National Radio Supplies

25 WATT .. $53.75, £26/17/6
17 WATT .. $43.75, £21/17/6
Post Extra on 15 Watt
N.S.W., 10/; Interstate, 15/.
25 Watt by Rail or Air.
Too Heavy, for Post.

NEW 17 & 25 WATT P.A. AMPLIFIERS

The 25 Watt Amplifier uses 5 valves plus 2 rectifiers including two EF86 low noise valves as microphone preamplifier and two EL34 valves Ferguson push-pull output.

All amplifiers are fitted with Ferguson output transformers with voice coil tappings of 2 to 15 ohms. The 25 watt amplifier can be supplied with line output transformer tapped from 100 to 600 ohms if required at 20/ extra.

Inputs provided for microphone, pick-up, and radio with mixing facilities and tone control.

The 15 watt is as above but using two 6BQ5 valves in push-pull output.

12in speaker for above (10 watt) .. .. $6.75 .. 67/6

Crystal Microphones for amplifier .. .. $4.75 .. 47/6

NATIONAL RADIO SUPPLIES

332 PARRAMATTA ROAD, STANMORE, N.S.W. PHONE 56-7398.

TMK TEST INSTRUMENTS

ALL TMK TEST INSTRUMENTS LISTED ARE FITTED WITH OVERLOAD PROTECTION

TMK MODEL 100K

100,000 ohms per volt for precision measurement. Self shielded movement. ½% precision resistors for high accuracy. Giant 5½" wide scale for easy reading. Unique "buzzer" for short tests. Frequency responce to 100KC. Overload protection.

SPECIFICATIONS

DC Voltages 0-.5, 2.5, 10, 50, 250, 500, 1,000 (at 100,0000 ohms per volt). A.C. voltages 0-10, 50, 250, 500, 1,000 (at 5,000 ohms per volt). Resistance 0-1K, 10K, 100K, 10meg, 100meg. D.C. current 0-10, 100 ua, 10, 100 ma, 2.5 and 10 amps. Dimensions 7⅞" x 6⅜" x 3⅛." Weight 3lb.

Price: $36.50

TMK MODEL 500

* Up-to-date design. * High sensitivity—30,000 ohms/V DC, 13,000 ohms/V AC. * Rugged construction-clear plastic panel and molded case. * Wide measuring range.

SPECIFICATIONS

DC Voltages: 0.25-1.25-10-25-100-250-1,000V (30,000 ohms/V. AC Voltages: 2.5-10-25-100-250-500-1,000V (13,000 ohms/V). DC Current: 0-0.5-5-50-500mA, 0-12A. Resistance: 0-60K, 0-6Meg-60Meg. Decibels: Minus 20db to plus 56db in 6 ranges. Audio Out: Capacitor in Series with AC Volt ranges. Short Test: Internal buzzer. Batteries: Penlight 1.5V x 1 and 15V x 1. Dimensions: 3 5/16" x 6 5/16" x 2¾." Weight: 1.5lb approx.

Price: $23.50

TMK MODEL TP-5S

* High sensitivity—20,000 ohms/DV, 10,000 ohms/V AC. * 3" Meter. * Handy pocketable size.

SPECIFICATIONS

DC Voltages: 0-10-50-250-500-1,000V (20,000 ohms/V). AV Voltages: 0-10-50-250-500-1,000V (1,000 ohms/V). DC Current: 0-50uA, 0-50-500mA. Resistance: 0-10-100K, 0-1-10Meg (62 ohms, 620 ohms, 6.2K, 62K at centre scale). Capacitance: 0.0001uF-0.005uF, 0.005uF-0.1uF. Decibels: Minus 20 db to plus 36 db in 2 ranges. Dimensions: 3¾" x 5¼" x 1¾". Weight: 15oz approx.

TP-5S TMK TESTER

Price: $14.00

TMK MODEL 700

* The device of "OVER LOAD PROTECTION." * Measuring range of AC CURENT: 0.5-5-50-500mA and 10A * Single scale, by using the switch for AC, DC and OHM.

SPECIFICATIONS

DC Volts: 8 ranges at 20,000 ohms/v 0-0.25-2.5-10-50-100-250-1,000-5,000V. AC Volts: 7 ranges at 4,000 ohms/v 0-2.5-10-50-100-250-1,000-5,000V. DC Current: 6 ranges 0-50uA 0-0.5-5-50-500mM 0-10A. AC Current: 5 ranges 0-0.5-5-50-500mA 0-10A. Resistance: 5 ranges X1, X10, X100, X1,000, X10K 30, 300, 3,000, 30K, 300K at midscale. Buzzer: For quick checking of resistance less than 2 ohms. NORM: OFF position (to shunt off meter). Bateries: 1-1.5V cell (Burgess No. 1 or No. 1303, 1115V cell (Bnrgess No. Y10). Test Leads: I pair. Size: 192 x 145 x 100mm. Weight: 3.3lb.

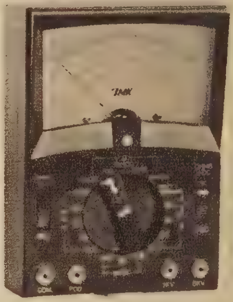
Price: $38.50

TMK MODEL 300

* UNIQUE DESIGN. * High sensitivity—20,000 ohms/V DC, 10,000 ohms/V AC. * Pocket-size lightweight.

SPECIFICATIONS

DC Voltages: 7 ranges at 20,000 ohms/V— 0-0.5-2.5-10-50-250-1,000-5,000V. AC Voltages: 5 ranges at 10,000 ohms/V — 0-2.5-10-50-250-1,000V. DC Current: 0-0.5-25-500mA. Resistance: R x 1, R x 100, R x 1K, R x 10K (13 ohms, 1.3K, 13K, 130K, ohms at midscale). Decibels: Minus 20 to plus 56db. Buzzer: For Quick shorts test. Batteries: 1.5V x 1 and 15V x 1. Size: 145 x 101 x 59mm. Weight: 1.25 Lbs.



Price: $19.50

TMK MODEL TP-10

* Rugged meter movement. * This construction - pocketable size. * 2,000 ohms per volt on DC and AC.

SPECIFICATIONS

DC Voltages: 0-10-50-500-1,000V (2,000 ohms per volt). AC Voltages: 0-10-50-500-1,000V (2,000 ohms per volt). DC Current: 0-500uA, 0-500mA. Resistance: 0-10K, 0-1Meg (60 ohms, 6K at centre scale). Capacitance: 0.005uF-0.2uF, 0.005uF-1uF. Decibels. Minus 20db to plus 36db in 2 ranges. Output Jack: For Audio measurements. Dimensions: 3½" x 5" x 1 9/16". Weight: 13oz approx. Batteries: Penlight 1.5 x 1.

TMK
TP-10 TMK TESTER

Price: $9.75

The TMK line of TEST INSTRUMENTS represents the instruments of the highest quality on the market. They are conservatively designed for reliability, accuracy and ruggedness, and are noted for the excellence in performance and appearance.

These INSTRUMENTS are products of skilled craftsmen and assembled under the supervision of experienced personnel. The instruments are available in a variety of ranges and sensitivities to meet the requirements of servicing of electronic equipment in the shops, factories, laboratories, field work and the home.

NATIONAL RADIO SUPPLIES

332 PARRAMATTA ROAD, STANMORE, N.S.W. — PHONE: 56-7398.

measurements at several levels over the entire surface of the earth.

AUSTRIAN AWARD

The Wien-Diplom (Vienna Award) is open to all licenced amateurs. There are two classes in the award.

Class 1. For contacts with all 23 Vienna Districts.

Class 2. For contacts with 15 Vienna Districts.

The contacts can be made on all bands open in Austria either on CW, Phone, SSB or mixed. All contacts made since April 1st, 1954 are eligible.

To apply for the award, a list of the QSLs' and log data certified by an official of the applicant's club or by another amateur is to be sent to OE1IU, Ernst Reisenauer, Vienna 16/107, P.O. Box 24, accompanied by 8 IRCs. On the QSL cards of the Vienna amateurs is shown either the number of the district or the number of the Post Office, sometimes both. The first is the district and the second the Post Office.

Under the same conditions, a SWL 'Heard Wien-Diplom" award will be made.

DIPLOMA "MOCAMBIQUE"

The Diploma "Mocambique" will be awarded to every Radio amateur contacting he CR7 stations under the following lauses:

1. First, second and third class Diplomas will be awarded to the amateurs having, espectively, nine, seven and six Mozambican districts, with a minimum number of en QSOs with different stations, except for CR6 - FH8-FR7-TJ-TN-TR-VQ7-VQ8-VQ9-9J2-9Q5-9U5 and 9X5 which have to make 20 contacts.

2. Only QSOs made after October 7th, 1965 will be acceptable.

3. QSOs to be made on any authorised band—phone, CW or mixed—the minimum acceptable reports being RST 338 and RS 33.

4. This Diploma will be awarded separate-y for phone, CW or mixed. A special men-ion will be made if all the QSOs were made on one band only. Whenever an amateur gets the conditions for a different band, a pecial stamp can be applied for. Each CR tation can be worked several times, provided it is in different bands or type of trans-nission.

5. Mozambican districts and respective bbreviations are:—

Cabo Delgado CD; Mocambique MQ; Gaza GZ; Niassa NS; Inambane IB; Tete T; Lourenco Marques LM; Zambezia ZB; Manica e Sofala MS.

All CR7 stations will transmit the name f the district following the name of the ownship. Where they have the QTH, or just he district's name in telegraphy, they will nly use the abbreviation.

6. This Diploma will be awarded to Short-Wave listeners as well, on the same condi-ons, provided they log a minimum of 5CR7 QSO's, except for the countries entioned under clause 1, when they are equired to log a minimum of 50 QSO's.

7. Applications must be sent to L.R.E.M., P. No. 812, Lourenco Marques, Mocam-ique, together with ten IRC's and a map r list showing the complete name and ddress of the applicant, his call letters and hose of the contacted CR7 stations, the and used, date, time (GMT) of QSO, the ceived and given reports, as well as the pe of transmission.

There is no need to send the QSL cards ong, as the league will obtain the con-mations. However, QSO's will not be nsidered if the applicants QSL cards have t been received by his contacted CR7 ations.

Applications for new Diplomas of differ-t classes (clause 1) or for stamps (clause 4) ust be sent together with the map but with e only IRC's, even when the application for more than one Diploma or stamp. Whenever required extra IRC's have been ceived, the League will airmail the respec-e Diplomas or stamps.

The award is made by Liga dos Radios nissores de Mocambique. ▬

Radio Free Europe headquarters today. A modern building in Munich, Germany, it is where most of the daily programming originates.

RADIO FREE EUROPE

. . . the voice of Freedom

A private, non-profit organisation dedicated to the ideal of self-determination for the peoples of Communist satellite countries is operating from Western Germany. It is known as "Radio Free Europe."

RFE, which was founded in 1950, is supported by contributions from individuals and businessmen, mainly within the United States. The organisation has a powerful network of stations, and broadcasts programs totalling 450 hours each week, in six languages, to five countries — Bulgaria, Czechoslovakia, Hungary, Poland and Rumania. Programs are broadcast 18 hours a day to Czechoslovakia, Hungary and Poland, and five hours daily to Bulgaria and Rumania.

RFE headquarters in Munich, Germany, house 17 studios and nearby, a large monitoring station keeps track of what 50 Communist radio stations and wire services have to say. Its 28 transmitters located at three sites in West Germany and Portugal have an aggregate power of more than 1,250,000 watts.

RFE's West German locations are utilised for medium-wave and some short-wave broadcasts, while transmitters located further west are necessary to provide full-time coverage of the entire area. Short-wave rebroadcast transmitters were built near Lisbon, Portugal. This combination of the Portuguese (short wave) and German (medium-wave) transmitters gives RFE listeners a wide choice of reception bands throughout the broadcast day. It also makes possible the broadcast of programs over an average of five to seven transmitters, simultaneously, thus radically reducing the possibility of completely effective Communist jamming.

Although management of Radio Free Europe is controlled by Americans, its programs are written and broadcast by exiles from the five countries to which programs are directed.

News, commentary, press reviews, religious programs, sports, cultural programs, music, youth programs, science and medical talks, women's hours, satire and more, are all broadcast by Radio Free Europe.

RFE, which also reports news of the free world, emphasises information and political commentary about the internal affairs of the five Communist satellite countries.

Since its opening back in 1950, Radio Free Europe has more than lived up to expectations. Lyndon B. Johnson, President of the United States, recently praised RFE as "a standing encouragement to those who value freedom and self-determination and a peaceful demonstration of our support for the enlargement of freedom in this area." ▬

RFE's Central News Room, Munich, Germany, where editors work around the clock writing stories based on monitored communist news copy coming in on the eight teletype machines around the office.

LISTENING AROUND THE WORLD

Art Cushen's monthly report on long-distance short-wave, television and broadcast band reception.

Radio South Africa Opens in May

The official opening of the South African Broadcasting Corporation's International Service is scheduled for May 1, when two of the four 250KW transmitters under construction should be ready to open the new world-wide transmission.

The first transmitter was opened in October, 1965, when the first transmitter went into service using the frequency of 4975KC. The station has now been moved to 4895 KC. The letter of verification of our reception on 4975KC came from the Head of the External Service, Mr J. A. Jooste, the full address being the South African Broadcasting Corporation, P.O. Box 8606, Johannesburg. Mr Jooste tells me the second transmitter is due on the air in March, and these two stations will form the basis of the new International Service. The transmitters are using new aerials, the only one available at present being for the 60 metre band, at Bloemendal. The new service will be supported by the 20KW Paradys transmitters as the new aerial arrays may not be completed by opening date.

The present African service of the SABC has been carried for some time on the Paradys transmitters, near Bloemfontein When completed the four 250KW transmitters and new aerial systems at Bloemendal will replace these.

DEUTSCHE WELLE RELAY

Interest in the reception of the Deutsche Welle relay at Kigali in Rwanda, Central Africa is world wide. In view of the increased possibilities of this new country being added to listeners' logs, we list below the new schedule received from the station, which is still conducting initial test transmissions to find its frequency performance before settling down to regular transmissions.

WEST AFRICA:	
0630-0830 GMT (English at 0630)	11905KC
1215-1445 GMT (English at 1215)	17765KC
1745-1945 GMT (English at 1745)	17805KC
2000-2300 GMT	11770KC
CENTRAL AFRICA:	
1100-1200	9735KC
1630-1730	9660KC
EAST AFRICA:	
1430-1500	11855KC
1515-1615 GMT (English at 1545)	9695KC

SAUDI ARABIAN TRANSMISSIONS

Reception of the Saudi Arabian Broadcasting System at Jeddah has been observed at 0400GMT when the station opens in Arabic its daily program on 9720KC. The signals are at good level and include the usual Arabic spoken and musical program. The latest information from Jeddah, as supplied by World Publications in Denmark, shows an increased schedule and the introduction of a foreign service. The foreign service scheduled is: Swahili 1600-1700 and Persian 1500-1600 on 11855KC; Indonesian 1300-1400 and Urdu 1400-1500 on 17840KC.

English 1100-1200 and 1700-1800 is on 725KC broadcast band. The Home Service schedule is in Arabic, 0400-0730, 1000-1455, 1635-2200 on 602, 647 and 725KC on BC and 7085, 7220, 9670, 9720, 11855, 11870, 11950 and 17840KC, unless these frequencies carry the foreign program.

RADIO VISION ON 6105KC

A new Colombia station, HJMV, which has the slogan "Radio Vision" and is located in Medellin, Colombia, has been heard in the afternoons in New Zealand on 6105KC. Signals are best on Sundays when the signal is heard from 0500 onward and is blocked at 0555 by the opening of Radio Free Europe on the same frequency. This new station plays mainly popular American and Latin American music. Its station identification is recorded and is announced by a voice with echo-effect with a roll of drums backing it. The new station has the mailing address of Aereo 3163, Medellin, Colombia. The station is reported to verify reports with a letter if return postage is enclosed with the reception report.

RADIO NEW YORK

The latest schedule of Radio New York World Wide is supplied in an issue of the Radio New York Short Wave Club Bulletin, the official organ of this new SW club. The club is open to listeners throughout the world and is associated with the station's program "DXing World Wide," which is broadcast at 2130 Saturday. The address is 4 West 58th Street, New York 19, N.Y., U.S.A. The present schedule of Radio New York's English broadcasts is as follows:

	GMT	KC
To Europe:		
	1200-1355	15155
	1400-2045	15440
	2100-2400	9740
	1200-1845	17845
	1900-2145	11970
To Africa:		
	1500-1945	17845
	2000-2145	11880
	1200-1500	17845
To Latin America:		
	1200-1355	15155
	1400-2130	15440
	2145-2400	11905
	1200-1445	15385
	1500-2145	17730

BETTER SW RECEPTION

Booklets designed to aid in better shortwave reception have recently been compiled by the technical staff of Radio Nederlands in Holland and are offered free to listeners. These booklets describe various phases of the hobby, and should be a great help to the new DXer. The address for copies of any of the booklets is **DX Jukebox,** Radio Nederlands, P.O. Box 222, Hilversum, Holland.

A Lot Depends On Your Aerial is a booklet which gives details on types of aerial systems. This new version of the booklet explains various types, construction, orentation and details of an aerial filter for improved results.

Short Wave Converter. This booklet covers the building of a short-wave converter covering 19, 16 and 13M bands. Instructions and diagrams show how to operate this unit, which converts short-wave bands to the 1500KC section of the domestic receiver. Its components have been selected so that they can be obtained all over the world.

This is DXing is an article in booklet form which gives details of the hobby It is illustrated and is a reprint of a featured item in one of Radio Nederlands program magazines.

The B.B.C. Monitoring Section at Reading, England, listens to short-wave broadcasts throughout the world, for news information and frequency and signal checks. The Monitoring Services on several occasions has enabled the B.B.C. to scoop the world by several hours on important news events. The staff keeps a multi-lingual watch on events and opinions covering 50 countries and in 35 languages.

English-Spanish Report Form is now available to help listeners to write to Latin American stations in Spanish. This form is a vocabulary giving words and expressions needed in English and the Spanish equivalents and is a very useful guide when writing to the numerous South American stations. The use of this form will increase the percentage of verifications from this part of the world.

All these booklets are available from DX Jukebox, P.O. Box 222, Hilversum, Holland.

RADIO NIGERIA

The Nigerian Broadcasting Corporation in Lagos has sent their new transmission schedule to one of our readers, Samson Voron, of Coogee, NSW, and to us. This covers the short-wave services, also the Home Services, and as most of this in on medium wave, and too difficult for reception we are listing only the short-wave transmissions for external reception.

The verification card has two panels of green with white centre overprinted in black VOICE OF NIGERIA, and with a coat of arms bearing the motto "Unity and Faith." The verification is from the External Propagation and Engineering Services, Ikoyi, Lagos Nigeria, West Africa.

GMT	KC	KW	Area
1300-2200	4990	20	West Africa
1300-1700	7275	100	West Africa, Central Africa
	9695	100	South Africa, Australasia
	11915	100	South Africa, Middle East
	15225	100	North Africa, Europe
1700-2205	7275	100	West Africa
	9690	100	North America
	11915	100	Europe.
	15255	100	North Africa

FRANCISTOWN BBC RELAY

Full details have now been supplied to us by the BBC in London, on the new Francistown, Bechuanaland relay station mentioned last issue. The station has now settled on two frequencies, and has also moved its short wave channel and medium wave frequency during February.

The service on short wave with relays of the BBC World Service is using 7295KC, 0400-0730, 1015-1145 and on 4842KC 1545-2015GMT. The medium wave station moved from 908 to 925KC during February to avoid interference. The power on 925KC is 50KW, while the short wave transmitter has the power of 10KW.

FLASHES FROM EVERYWHERE

RWANDA. Deutche Welle relay station, at Kigali, will soon have four transmitters of 250KW at this site, and will then beam programs to North and South Africa, as well as to Australasia. The present time of 13½ hours will be increased by a further 2½ hours during this year. The Government-operated local Radio Rwanda, also in Kigali, now uses 6060KC with 50KW, according to world publications.

SOMALI Republic station Radio Mogadishu is on a new schedule on 7160, 7120, 4970KC, 0300-0500, 0930-1130, 1200-1530, 1630-1900. English at 0315-0330, 1830-1840; Italian 1045-1100, 1800-1830; Arabic 0300-0315, 1730-1800; Somali 0330-0500, 0930-1035, 1200-1500, 1630-1730, 1840-1900. The address of the station is Radio Mogadishu, Mogadiscio, Somali Republic.

COLOMBIAN station La Voz de Llano, Villavicencio, is now heard on 6117KC to sign off 0400. HJCT in Bogota, Radio Nacional, has been making some frequency changes. It is now on 6175KC or 6180KC, and is heard also on 4950KC to sign off at 0455. HJVN Radio Horizonte, Bogota, signs on 5970KC at 0900 and is giving good reception on this channel.

BUSINESS SUCCESS IS WON BY NIGHT

To deal efficiently with all the problems which come his way, a successful businessman has to be a practical psychologist, an expert at selecting, placing and motivating staff, a past master at writing action-getting letters and reports, a skilled negotiator able to communicate effectively with others. He must possess the ability to sell his ideas and himself to others, be a capable public speaker, an inspiring leader, a top class manager and administrator.

He must have a sound understanding of all the major profit-producing factors in business, be a creative thinker, a problem solver, able to conduct fruitful meetings. He must understand the principles related to advertising and public relations to promote and protect his company's image. He must be acquainted with modern marketing methods, motivational sales management and dynamic retailing.

He must be equipped to draw a correct diagnosis from financial statements and when credit is called for he must know his way around the financial world. He needs to have an understanding of economics, the stock exchange and investment matters, and be able to play "the host with the most" when entertaining VIPs. A tall order if ever there was one, but nevertheless imperative.

This is why success favours the man who can cope with all situations — the generalist. Obviously such a man has no time to waste. He needs to keep up with this ever-changing world of business.

Since his days are devoted to "action", no wonder he appreciates a few quiet moments at night, browsing through a new publication designed to give him in a time-saving form thousands of profit-producing ideas and all he needs to know about business success and how to achieve it.

FREE! Informative booklet entitled "How to Succeed in a Man's World" outlines a practical plan to help you achieve greater business success.

WS4816

MAIL THIS COUPON TODAY

To: MAN'S WORLD, 109 Sturt St., South Melbourne, Vic.
Please post me a copy of your FREE booklet.

NAME ....
(Please print)
ADDRESS ....
.... State ..
Occupation E/4/66

SOUND PROJECTORS

Cinevox Prefect 16mm in good working order, 240v operated, complete with speaker and amplifier.

$95.00

CIRCULAR SLIDE RULE

3¾in diameter. Will do the same work as the conventional slide rule. Instruction book included.

$1.25 each. Post 10c.

REFLECTOR GUNSIGHT

Contains these lenses:
1 Lens 1in Focus, 1½in diam.
1 Lens 1 11/16in Focus, 1¼in diameter.
1 Air-spaced Lens, 1¼in diam.
1 Filter Lens, 1 Graticule.
1 Lampholder.

$1.85 each

Post.: N.S.W. 30c; Interstate, 40c.

PMG TYPE TELEPHONES

Standard desk type with magneto calling device. Range 30 miles. Uses standard batteries at each phone. Any number can be connected together on single line. Complete with 660ft wire.

$23.00

(2 TELEPHONE SETS)

30c cartage to rail. Freight payable at nearest attended railway station.

AERIAL CAMERAS

F.24 Mark IV 2.9 Lens, stops 11, 8, 5.6, 4, 2.9.
With 3" x 8" F1 Dallmeyer Lenses complete with wooden case.

$39.00

50c Cartage to Rail. Freight payable at nearest attended railway station.

WALL CLOCKS

Smiths electric or 8-day wind-up, slightly used but perfect.

8in dia.	$ 9.50
9in dia.	$ 9.75
12in dia.	$11.50

Post 50c N.S.W. Interstate 75c.

TRANSFORMER

AGC. Single phase, 1.75 Kva primary volts, 100-200, 110-220, 120-240, 130-260, secondary, 2,200 1,700 at FL. PF equals 1.0. $35.00.

12 CREED TELEPRINTER

Tape printers model 47.R 240 Volts operated.

$35.00

TELEPHONE WIRE

21 gauge copper, plastic covered. Ideal telephone or bell wire. 1,320ft coil of twin (equal ¼ mile), $7.00 per coil.
Post., N.S.W. 70c; Interstate $1.20.

3000 TYPE RELAYS

P.M.G. 200 Ohm — 1,500 Ohm Coils, $1.25 each.

2-WAY RADIO

NUMBER 22 (AUST.)

Untested without meter or leads, with power supply less relays. $15.00. 50c cartage to rail. Freight payable at nearest attended railway station.

A.W.A. 6 or 12 volt

Transmitter 70 to 80 megocycles $15 240 volt power supplies for receivers. $15, 50c cartage to rail. Freight payable at nearest attended railway station.

POCKET 420 M/CS RECEIVERS

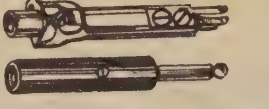
Contain 6 transistors and 3 diodes, pot cores, resistors, etc. Suit conversion to other frequency or for "Foxhunt Sniffers." Complete in case 3in x 5in x 1in.

$10.00

AWA OSCILLOSCOPE

Calibrated with delay time base 5in, 240 vac. perfect.

$195,00



P.M.G. Phone Jack and plugs 25c each, 45c the pair.

NIFE CELLS

1.2 Volt fully charged, 4in x 3in x 1in 4 AH.

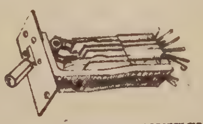
$1.00 each

Post. N.S.W., 25c; Interstate 35c.

PERSPEX

Slightly domed shape, 16in x 12in, $1.55. 2ft 6in x 18in tapering to 6in, $1.75. 2ft 6in x 2ft, $2.45. Domed approximately 3ft 6in x 2ft, $5.50.

50c cartage to rail. Freight payable at nearest attended railway station.



P.M.G. TYPE KEY SWITCHES
45c each. Post 15c.

VALVES

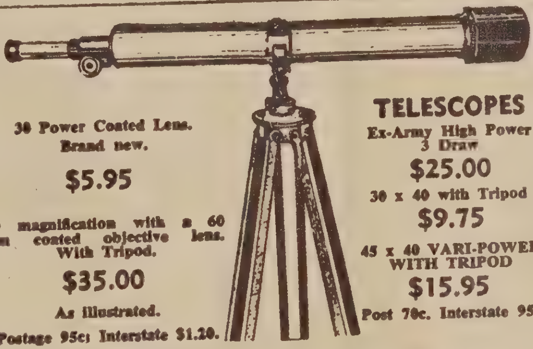
BRAND NEW

IN CARTONS

Special discount for quantity

6SN7GT	95c	6AG5	50c
89	$1.00	X61M	$2.20
12SA7	$1.25	CV850	75c
6H6	45c	18H6G	30c
41	$1.25	832	$5.00
5U4G	95c	6F13	75c
77	$1.00	6AK5	$1.75
VR150-30	$1.00	6X4	$1.00
		6F8	75c
5CP1	$3.95	6N7	$1.00
EF50	35c	12SK7	50c
6U7	75c	VR1120	50c
V1103	$1.00	VR118	75c
VH120	75c	VR65	25c
1L4	$1.00	6R7GT	50c
10	$1.00	VT4C	75c
5Y3	$1.25	AU5	$1.00
6C4	50c	80	$1.25
CV2184	$2.25	6AK5W	$1.50
6AK5	$1.50		

PLEASE ADD POSTAGE ON ALL ARTICLES



30 Power Coated Lens. Brand new.

$5.95

60 magnification with a 60 mm coated objective lens. With Tripod.

$35.00

As illustrated.

Postage 95c; Interstate $1.20.

TELESCOPES

Ex-Army High Power 3 Draw

$25.00

30 x 40 with Tripod

$9.75

45 x 40 VARI-POWER WITH TRIPOD

$15.95

Post 70c. Interstate 95c

HIGH STABILITY RESISTORS

I.R.C. brand new ½w, 1w, 2w, tolerances between 1 and not exceeding 5% including 100, 360, 560, 750, 15K, 22K, 27K, 100K, 180K, 220K, 560K, 820K, ohms. Usual price 40c each, 50 assorted different values for only

$3.75 Post 15c

ASTRONOMICAL TELESCOPES

3¼in, Reflector, 126 magnification. Complete with 4x finder and equatorial mount.

$59.00

Post.: N.S.W. 70c; Interstate $1.20.

THEODOLITE

Cooke Troughton and Simms, London. Microptic. Tested. Complete with Tripod. $275.00.

522 TRANSCEIVERS

100 to 150 m/cs.

$35.00

TR1934 TRANSCEIVERS

100 to 125 m/cs.

$33.00

GENUINE VARIACS

0-115 V.A.C. 18 Amps $29 each, or couple two together for 240 V.A.C.

The two for $45

Genuine American Zenith Variacs

0-115 V.A.C. 7.5 Amps $19.50 each or couple two together for 240 V.A.C.

The two for $36.

50c cartage to rail. Freight payable at nearest attended Railway Station.

C.M.A. CABLE

240 volt 3/.036 black, new and perfect. 100 yds. rolls, $3.00 6 or more.

$2.50 a roll

30c cartage to rail. Freight payable at nearest attended railway station.

MICROMETERS

Brand new Goodell-Pratt, 0 to 1in, $7.50; Slocombe 1in-2in, $7.85; Starrett 1in-2in, $9.85.

Post 32c.

CHOKES, 7.5H, 60mA 95c
VIBRATORS, 6 volt, 7-pin, 75c each.
UNISELECTORS, 4 BANK HOMING TYPE $4.00
INVERTERS, 26v-115v 2KW 400 cycle $9.50
HAND MICROPHONES, with Press-to-Talk Switch .. 95c ea. Post. N.S.W. 25c, Interstate 30c.
INSTRUMENT TRIPODS, sturdy wooden frame. Telescopic. Extend to 4ft 6in $13.00
SELSYN MOTORS MAGSLIP Mk. II .. .. $5.25 ea.
No. 19 2-way radios, with hand set, power supply, leads, $35.00
Meggers, bridge type, complete and tested $75.00
EVERSHED and VIGNOLES. 500 volts.

H.T. TRANSFORMERS

2,000/0/2,000 volt. Primary 28 volt 50 cycs. rated at 1.75 Kva., Ideal linear amplifier, etc.

$27.00

BINOCULARS

PRISMATIC. Coated Lenses. Brand new. Complete with case.

8 x 30	$19.50
7 x 50	$26.50
10 x 50	$27.50
12 x 50	$28.50

Post. N.S.W. 70c, Interstate $1.20

SPECIAL ARMY RELEASE

TELESCOPES

ALL LENSES "ASTRONOMICAL" QUALITY

General and Marine Use

4 x 40 Genuine HANDLEY. Cost $60.00. Our Price $6.50
7 x 40 GENUINE OTWAY ANGLE TELESCOPE, Cost $90. Our Price $9.85
15 x 40 variable Power Otway, $15.50.

Freight payable at nearest attended Railway Station.

420 Mc/s OSCILLATOR

Self-excited 6J6 with power supply and modulation transformer, 5in x 5in x 5in box. 240 volt operated.

$15.00

SHIPS CLOCKS

Seth-Thomas (no bell) eight-day fully jewelled, costs $120.00. Brass 7" $25.00, splash-proof bakelite 10½" $30.00. Posted N.S.W. 70c, Interstate $1.20.

RECORDING TAPES

SCOTCH BRAND
EX WOOMERA
SLIGHTLY USED
PERFECT ORDER

Can be used for home video, tape recording equipment, etc.
2,400ft 12in Reel ½in Top Grade. Cost $14.50. Our price $7.50 roll. Post 70c, Interstate 95c.
Also same in ¼in. Ideal for professional quality audio recording.
1200ft 7in reel ¼in $2.75. Post 12c
600ft 5in reel ¼in $1.68. Post 12c
200ft 3in reel ¼in 65c. Post 10c

SCOOP PURCHASE

Gramo. Motors. New. Made in U.S.A. 4-speed. 240 volt AC. 50 cyc. Only $2.75 each.
Post N.S.W. 30c, Interstate 40c.

240-110 VOLT 6KVA TRANSFORMERS

Encased, including switches, as new, $50.
Top grade, full enclosed transformer, 1 Kva primary 218/240 vac. 50 cycs. secondary 6 volt, 37 volt, 53 volt, 60 volt, $30.

LEAD ACID BATTERIES

New 2 volt 1.5 amp $1.75, 12 volt 0.75 amp $3.75.
Post N.S.W. 25c, Interstate 30c.

SPECIAL lucky dip valve offer. 15 new valves in cartons for only $2.00. We haven't got time to sort them, so you reap the benefit. Post 30c.

SOLENOIDS

Plunger Type 12V 300M.A. Suit electric camera control, MINIATURE TRAINS, radio, etc. $1.25, post 10c.

MICROSCOPES

600 x 3 Objectives, Complete in Wooden Case.
Post N.S.W. 50c, Interstate 60c.

$7.95

TELEPHONES

Sound Powered. Can be used as Microphone and Receiver. New. With 50ft cable.

$3.85 pair

Post 25c, Interstate 40c.

DEITCH BROS.

70 OXFORD ST., SYDNEY

Between Crown and Riley Streets, City.

SORRY, NO C.O.D.

MONROVIA, site of the new BBC West African relay base in the Liberian Republic, has been noted in Europe with its relay of the BBC World Service to sign off at 0800GMT. The station uses the 9555KC channel, and the signals in Europe are at fair level, but the reception in the Pacific area is poor at present. The sign off announcement of the station, which is at Plainsville, outside Monrovia, gives full details on the station frequency and programs for the next transmission.

MAURITIUS Broadcasting Service at Forestside is also being heard in Europe by Benelux DX Club members with news in French at 1730GMT. The station is on 4850KC and also carries BBC World Service news at 1800GMT. The transmission should be received in the Pacific area in April also at these times, when African signals are at peak in the equinoxal period.

WARSAW signals are reported by New South Wales listener John Heron as being best received in the second transmission, from 0830 to 0900GMT, and the best frequency 9675KC. Two other channels used are 11840 and 15120KC.

ROME in its transmission in Italian for the Pacific is heard at 1200GMT, using two frequencies, 17800 and 15400KC, and the program provides good reception for Italians living in the Pacific area. This replaces the former service at an earlier hour, and the English period has been replaced by the 2205GMT transmission on 9710 and 6010KC.

MONROVIA station ELWA, in the Liberian capital, has made a move to 11950KC from 11975KC. The transmission is in English 0600-0745, and 0745-0815 in Hausa, beamed to Central Africa. The signals in the Pacific suffer interference from BBC London on 11955 0700-0845GMT.

MALAYSIA site of the BBC relay station at Tebrau has been heard on 11970KC from 0915, replacing the 11955KC channel with BBC World News. Another new frequency, 9640KC, also heard from 0915, has been heard, but suffers interference from the Seoul station on the same frequency. BBC Far East Relay at Tebrau is best on 11750KC at this time; 9725 suffers interference from Moscow and 15435 from Peking when transmissions open at 0915 with BBC World Service.

KARACHI, in Pakistan, is using the frequency of 9820KC for a transmission which has been heard as early as 1430GMT. At 1500GMT the station carries the usual 10-minute English news bulletin, which is common on all Radio Pakistan stations both on medium and short-wave.

PARIS, in France, with the ORTF transmissions, is using the new frequency of 9500KC for a transmission in English from 9445 to 0515GMT. This transmission gives good reception, and according to the station announcement Paris is also operating in the 25M band at the same time. The English transmission is also carried by the relay station in Brazzaville, using frequencies in the 60, 49, 31, 25 and 19M bands. Paris has also been noted with a test transmission on 5955KC to close at 0830. This is a relay of the Home program, also carried on 9560KC.

KUWAIT in the home program of the Kuwait Broadcasting Service is reported by the Swiss DX session to be using the new channel of 6005KC. The station, which has all its programs in Arabic, is heard in Europe from 1800 to 2100GMT, when the station sign off is heard.

ROME'S transmission to Australia and New Zealand has been switched for morning reception in this area, instead of the usual evening program. The Rome transmission of Radio Italiania is now on the air 2205-2225. The frequency 9710KC is also used by VOA Greenville, which causes some interference to 2215. Rome is also using 6010KC for this English transmission to the Pacific area.

SESSIONS FOR THE SW LISTENER

Some readers have asked for details on the various DX sessions and those which give information for the short-wave listener, on reception and other radio problems. We have listed below the ones we find most interesting, and they also include some of the mailbag sessions in which stations acknowledge letters and give details on their transmissions.

STATION	KC	DAY	GMT
Radio Canada	5970, 9625	Sunday	0740
FEBC Manila	11855	Monday	0915
BBC London	11750, 15070	Monday	0935
Radio Sweden	11810, 15195	Tuesday	1115
Radio New Zealand	9540, 11780	Wednesday (1st)	0640
Radio New Zealand	9540, 11780	Wednesday (1st)	1030
Radio Nederlands	9715, 11730	Thursday	0745
Radio Denmark	15165	Thursday	0745
Radio New Zealand	9540, 11780	Friday	0700
BBC, London	9410, 12095	Friday	0030
Berne, Switzerland	9670, 11865	Saturday	0730
Radio Canada	5970, 9625	Saturday	0745
Berne, Switzerland	11865, 15305	Saturday	0915
Radio Canada	9630, 11720	Saturday	2115
Radio New York	11970	Saturday	2130
Radio Australia	15240	Saturday	2200

CAIRO, in Egypt, has been observed with the following schedule of English broadcasts carried over its transmitters: 0630-0700 on 7075, 9475; 1330-1430 and 1745-1845 on 17920; 2045-2145 on 15290; 2130-2230 on 9475, 9670 and 11915KC. French is broadcast 1845-1945 on 15290, and 1930-2030 on 9475 and 11915KC.

WINDWARD ISLAND Broadcasting Service has been heard 1930-2015 on 15135KC, beamed to Ascension Island. They announce they are on 15135 and 5010KC, as well as on medium wave. At 2030GMT the station on 15135KC is beamed to Jamaica from 2015-2130. The 11895KC station opens at 2015GMT in its coverage of the Caribbean area.

IRAQ over Radio Baghdad has its English transmission on two frequencies, 6095 and 6030KC, 1930-2020GMT; in German 2025-2100; and French 2100-2200GMT.

SOFIA, in Bulgaria, is reported by Bill Hawthorn, Warrnambool, Victoria, to be heard in a transmission to Africa, 2105-2135 using 7255KC. Reception is good, and the station also announced that other channels in the 25 and 31M bands are also carrying the same program.

DJAKARTA has made a frequency change for its transmissions in English at 1530GMT, which were heard for many months on 9585KC. Reports indicate the frequency is now 9770KC, and on this channel interference is too severe to determine much of the transmission contents, but the station is scheduled to operate on this frequency from 1445 with English news, Arabic program at 1530 and sign off is at 1600GMT.

MALAYSIAN station in Kuala Lumpur has its Commercial Service on the shortwave channel of 7300KC. English news is carried at 0930 and 1400GMT and at good level.

BELGIUM station which carries gospel programs exclusively in Russian is reported in the Swiss DX Session as on the air 1515-1545, 2115-2145 on 6350 and 11550KC. The station address is P.O. Box 272, Antwerp, Belgium. The station was formerly a commercial station which operated off the Belgium coast. Taken over by a gospel organisation, it continues to operate in the Russian language only. The station has been noted to make slight frequency changes to avoid interference from nearby telegraphic stations, as it operates well outside the normal international SW bands.

BUDAPEST, in Hungary, is on a new schedule, including the use of 3995KC, reports Radio Sweden. German transmissions 1945-2000 and 2130-2145 on 3995, 6235, 7220KC. English to Europe 1930-1945 on 3995, 5900, 7305, 17780; 2200-2230 on 3995, 5900, 6234, 7215, 7305; 2330-2400 on 6234 and 3995KC.

HANOI'S signals in the Voice of Vietnam program have been giving good reception at the listening post of Ron McLeod, at Torrensville, S.A. Signals are best at 1000GMT when news in English is broadcast, with best reception on 11760KC, but this signal suffers some sideband interference from the BBC relay station on 11750KC. Signals from Radio Ghana, previously reported in these pages, are heard on 9545KC, opening with the familiar drum beats at 0705GMT, followed by a program in English. The transmission suffers some sideband interference from Radio New Zealand on 9540KC at the South Australian reception area.

LEBANON'S foreign service from Beirut is now on the air to Africa 1830-2030 on 11770, to South America 2300-0100 on 9550 and to North America 0130-0400 on 9710KC. The 9710KC is new and has been heard in New Zealand in English 0230-0300GMT.

SPANISH National Radio, Madrid, is now on 9570KC and blocks Radio Australia's signal in Europe to 0925GMT. Madrid, at this time, has transmissions beamed to Eastern Europe and the new channel

BARGAIN SALE

- Valves
- Pots
- Resistors
- Condensers
- P.M.G. Relays
- Switches
- Meters
- Diodes
- Aluminium Tube and sheet
- Radio and Radar Disposals.

INSPECTIONS INVITED
Open Saturday Morning

WRITE OR CALL FOR FREE
Price lists to:
HARE & FORBES PTY. LTD.
180 George Street,
PARRAMATTA, N.S.W.
635-9947 — 635-6096

NAME ....
ADDRESS ....
....
PLEASE PRINT CLEARLY

CHOOSE THE BEST—IT COSTS NO MORE

OTL

RESIN CORE SOLDERS
for reliable connections

O. T. LEMPRIERE & CO. LIMITED. Head Office: 27-41 Bowden Street, Alexandria, N.S.W.
and at Melbourne • Brisbane • Adelaide • Perth

THE TELESCOPE MAKER

Build your own powerful astronomical telescope.

MIRROR GRINDING

IT WORKS!

FREE CATALOGUE of ● Do it yourself kits. ● Telescopes. ● Optical parts. ● Lunar Maps. ● Star Atlases. ● Books. ● Binoculars. Special—a two-coloured Lunar May 10½" x 10½" listing 300 formations. Add 4c Postage. Price 25c.

AMATEUR ASTRONOMERS SUPPLY CO.
17 ALEXANDER STREET, CROW'S NEST, SYDNEY, N.S.W. Phone 43-4360.

SAVE $100's with these 3 great new *DO IT YOURSELF* volumes

Step by Step to a BETTER HOME

★EXPLANATORY FULL COLOUR SECTION
★ALL THE LATEST IDEAS
★700,000 WORDS IN 1,600 PAGES
★2,500 A-Z SUBJECTS BY 15 EXPERTS
★1,000's OF ILLUSTRATIONS

FREE!
—to every purchaser ABSOLUTELY FREE a Tool Every Home Needs—MULTI - GRIP All - Purpose WRENCH. Beautifully machined, long for easy leverage, tough tool steel for enduring strength. Adjusts for small or out-size nuts; grips and shifts stubborn pipes, shafts, etc., etc.

3 TIMES VALUE
of any other Do-It-Yourself. More Details, More Subjects, it's COMPLETE.

Newnes New PRACTICAL HOUSEHOLDER ENCYCLOPAEDIA counteracts the ever-rising cost of repair, maintenance and improvement to your home. It gives you expert, up-to-date guidance in simple language, shows you how to make fitments and built-in furniture, make home extensions. All latest innovations are given: double glazing, central heating, draught-free porches, room dividers. Everything you want for a better home, inside or out. Includes handicrafts for winter months, to save you hundreds of pounds in bills and make your home worth more in hard cash! See this new home handyman today . . . send for Free Examination and use it right away!

EXAMINE THE 3 BIG BOOKS AT HOME *FREE* FOR 10 DAYS. NO ONE WILL CALL

PERGAMON (AUSTRALIA) PTY. LTD., 20-22 Margaret St., Sydney, N.S.W.

Please send me Newnes PRACTICAL HOUSEHOLDER ENCYCLOPAEDIA without obligation to purchase. I will either return the work within 10 days or I will send the first payment of $1 (10/-) 11 days after delivery, then 14 monthly subscriptions of $2 (£1) until the sum of $29 (£14/10/-) has been paid. The cash price within 10 days is $27 (£13/10/-). The offer does not apply to overseas purchasers, who should send the cash price of $27 (£13/10/-). Remittances by cheque MUST be in dollars (Australian).

Mr./Mrs./Miss ....
BLOCK LETTERS PLEASE

Full Address ....

Tick ✓ where applicable
The address on left is—

My Property	☐
Rented Unfurnished	☐
Rented Furnished	☐
Parents' Home	☐
Temporary Address	☐
Boarding	☐

Occupation ....

Your Signature ....
(Parent to sign if you are under 21)

EA366

This coupon is invalid if not signed and all questions answered.

replaces the old 9615KC frequency. The frequency is also heard in other transmissions on this new channel. The Madrid program to North America in English has been observed on 9760KC at 0220GMT.

BERLIN International transmissions to Central Africa are now 0345-0430 on 11795, 1215-1300 17825, 1600-1645 11795KC; to West Africa 0615-0700 on 9575, 1315-1400 on 17825, 1915-2000 on 11820; to East Africa 1600-1645 on 15240KC.

VIETNAM transmissions from Hanoi now carry a service for the American Forces in South Vietnam. The station is on the air 2300-2330 with repeats 1300-1330; this is in addition to its usual Overseas Service. The frequencies used for reception in South Vietnam are 9840 and 11840KC.

BROADCAST BAND NEWS

INTERNATIONAL WATERS — Further news on the off-shore stations broadcasting for listeners in Britain is that Radio Scotland is now on 1260KC. Radio Caroline South was driven from its moorings during a storm and is off the air while installing a new 50KW transmitter operating on the changed frequencies from 1520 to 1223KC. Radio London has now increased its power to 50KW on 1125KC. The reception of these stations is possible at dawn during April when the equinoxial period permits signals from Europe to be heard in Australia and New Zealand, as signals trave throughout the darkness from Britain to the Pacific area.

PORTUGAL—A new commercial station is soon to open in Portugal with the powe of 250KW and a short-wave relay of 30KW The organisation building the station formerly operated Radio Africa at Tangie until it was closed, and also owned som of the prewar commercial stations whic operated in France. These new stations ar not expected on the air for a year.

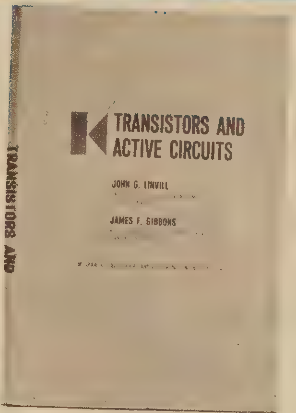
NOTES from readers should be sent to ARTHUR CUSHEN, 212 Earn Street, Invercargill, N.Z. All times are Greenwich Mean Time, add 8 hours for Perth, 10 hours for Sydney and 12 hours for Wellington time. All frequencies are in kilocycles.

HAWAII—Three stations in Hawaii hav recently made call changes, and as signal from this area provide good reception a 1600GMT during most of the year, thes three new call signs will be heard b readers. The major change is on 790K with the new call KONA, operated b Moana Loa Broadcasting Inc., Kealaleku which was formerly KEKO and opens 1600GMT. The other two changes a KCCN Honolulu whose new call is KOL on 1420KC; while KHBC in Hilo h changed to KPUA. Both these station suffer from interference from Australian a night transmissions, 970 from 5DN an 1420 from 3XY.

SOUTH ARABIA—The BBC relay sta tion on 701KC, located on Perim Islan off the South Arabian coast, which h been in operation for some months wi mainly Arabic transmissions relayed fro London has the power of 10KW, n 400KW as was first reported. This statio replaced the Somali BBC relay station, al on 701KC which was closed down so months ago due to diplomatic differenc between the Somalia Republic and Britai The relay on the small island of Perim the entrance to the Red Sea provides e cellent coverage of the East African a Arabian area, and carries the relays of t BBC Arabic programs from London, the being heard at dawn or about 1600-17 GMT.

TECHNICAL BOOKS AND PUBLICATIONS

For Engineers and Graduate Students



RANSISTORS AND ACTIVE CIRCUITS, by ohn G. Linvill and James F. Gibbons. Hard overs, 6in x 9 in, 511 pp., with many illusations. Published by McGraw-Hill Book Co. ic., New York. Price in Australia $15.25 52/6).

J. G. Linvill is Professor of Electrical ngineering at Stanford University, and J. Gibbons is an Associate Professor in the me department. "Transistors and Active ircuits" evolved from class notes prepared r graduate students in E.E. at Stanford, d is intended for graduate students and gineers.

In their preface the authors give as their m the identification and discussion, in a nsistent theoretical framework, of basic sues concerning semi-conductor devices active cicuitry. The theoretical approach opted is the "classical" one of carrier otion in a solid, rather than the perhaps ore conventional approach involving quanm theory. This is done with a view to ving a more familiar and more useful asp of basic transistor physics to those gineers whose original training was of a ssical nature. The authors stress, hower, that the circuit models that are deloped are identical with those derived by more conventional approach.

A second departure from the conventional proach is in the use of lumped models the visualisation and calculation of reionships between physical variables. though at first sight this appears to comcate a subject that to many will be eady rather heavy going, the authors im that in the long run it not only plifies derivation of the accepted term- characteristics, but also that it bles one to treat in routine fashion nomena normally treated as "special es" — such as drift fields in the base region, avalanche multiplication and recombination traps.

The first section of the book deals with the physics of semiconductors, and contains some eight chapters discussing structure and carrier density, physical processes, P-N junctions, diffusion models, drift transistors and other phenomena and devices. It contains a glossary of circuit models of transistors.

The seven chapters of the second section cover two-port network theory. Topics discussed include representation and parameters of linear two-port models, properties of systems, selection of terminations, stability, sensitivity of performance to parameter variation, and piece-wise-linear networks. The final section deals with transistor circuits, and its seven chapters discuss amplifiers, non-regenerative and regenerative switching applications.

The book appears to be well written, and the material is presented in a form that should be found quite convenient and useful by the class of reader for which it is intended. It should be of considerable assistance to those who must perform analyses of complex transistor circuits.

Not for the technician or experimenter, this one, but worth yof inspection by many graduate students and engineers (J.R.)

NERAL ELECTRIC GLOW LAMP MANUAL, edited by J. W. Tuttle and C. R. Dougherty. Soft cover, 105 pages, 8½ x 5½ inches. Published by the Miniature Lamp Department, Product Planning and Application, General Electric Company, Nela Park, East Cleveland 12, Ohio. Available from Australian General Electric Pty. Limited, 103 York Street, Sydney. Price $1.25 (12/6) plus postage where applicable.

s suggested by the title, this book gives omprehensive listing of the glow-lamp ducts of General Electric. Twenty four es are devoted to the individual charristics of these lamps. The remainder the publication is divided into five secs as follows: Physics and Characteristics Glow Lamps; Relaxation Oscillators; ic and Computer Applications of Glow ps; General Glow Lamp Applications Glow Lamp Test Methods.

mongst the many applications discussed hese chapters are those involving Eleic Organs, Time Delay Relays, Temperre Indicators, Bistable and Monostable tivibrators, Memory Circuits, Voltage ulators, and many others. In fact, to ab through the first eighty informationed pages is to realise that the modern lamp is very much a part of advanced tronic circuit technology. It is far from being just a lamp that glows!

In all, the information contained in the book should prove interesting to the amateur constructor as well as the design engineer for both a practical and theoretical approach has been combined within its pages. Our review copy was made available by Australian General Electric Pty. Ltd., who advise that copies are in good supply. (K.W.)

★ ★ ★

SEMICONDUCTOR CIRCUITS HANDBOOK, Vol. 1. Soft cover, 191 pages, 9 x 6 inches. Published by Techpress, Inc., Brownsburg, Indiana, U.S.A. American price $2.95 (29/6).

This publication is divided into five sections featuring in all 71 practical circuits for the experimenter and hobbyists. The sections are titled: Direct-Coupled Amplifiers; High-Frequency Amplifiers; AF and RF Oscillators and Switching Circuits. The circuits given are clearly laid out, each with a short resume of operation and possible application. Where critical components or transistors are used, this is pointed out in the text.

For the most part, the circuits are of fairly sophisticated devices, likely to be of interest to advanced experimenters and hobbyists, to licensed amateur operators and engineers, to whom the many circuits would form an "ideas pool." Such readers should be well able to adapt the basic ideas and circuits to their own purposes and, where necessary, up-date them to cover newly-released semiconductor types.

One effect of reading the book is to remind one of the variety of directions in which semiconductor devices are being used —and the presentation is by no means exhaustive!

However, hobbyists just starting out might find themselves wishing for fewer and simpler circuits but with more space devoted to explanation and construction data. A book like this belongs more to the second stage of technical advancement.

Our review copy came direct from the publisher. However, no details have been supplied as to when local release of this publication can be anticipated. (K.W.)

★ ★ ★

SEMICONDUCTOR RECTIFIER COMPONENTS GUIDE. Contributors, F. W. Gutzwiller, G. H. Bacon, E. E. Von Zastrow and R. R. Rottier. Soft cover, 142 pages, 8½in x 5½in. Published by the Application Engineering Centre, General Electric Company, Rectifier Components Department, Auburn, New York. Australian price, 75c (7/6).

This informative little book is very well illustrated and should be of considerable value to designers of modern semiconductor power supplies. As the name suggests, rectifiers are dealt with at some length, and guidance is given as to the best selection of rectifiers for the job in hand. To this end, charts and tables are numerous.

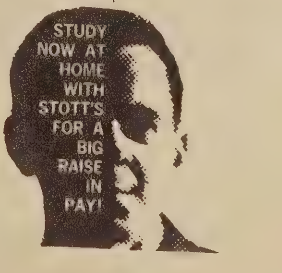
Stotts
TECHNICAL CORRESPONDENCE COLLEGE

Stott's renowned home-study courses can raise your pay. Each course has been prepared by highly-qualified professionals. Stott's step-by-step instruction plus the personal tuition of expert instructors will ensure fast and thorough progress.

( ) Radio for Amateurs
( ) Automobile Mechanics
( ) Diesel Engineering
( ) Machine Shop Practice
( ) Fitting; Lathe Work
( ) Milling, Grinding
( ) Shaping, Planing, Slotting
( ) Mechanical Draftsmanship
( ) Survey Plan Drawing
( ) Boiler Attendants' Exam
( ) Mechanical Engineering
( ) Structural Draftsmanship

Stott's curriculum contains over 100 courses.

POST THIS COUPON NOW
STOTT'S TECHNICAL CORRESPONDENCE COLLEGE
157 Flinders Lane, Melb. 383 George St., Sydney. 290 Adelaide St., Brisbane. 45 Gilles St., Adelaide. 1130 Hay St., Perth.
Please send me your prospectus on
....
MR.
MRS. ....
MISS
ADDRESS ....
.... AGE ....
I understand that no sales representative will call on me.
RH466.



★★★★★★★★★★★★★★★★★★★★★PHONE 51-3845

A. C. E. RADIO

AMPLIFICATION
COMMUNICATION
ELECTRONICS

136 VICTORIA ROAD, MARRICKVILLE, SYDNEY,
AND 636 KING STREET, NEWTOWN—51-7008

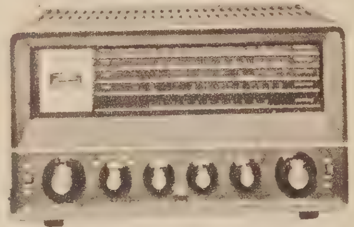
136 VICTORIA ROAD, MARRICKVILLE — 51-3845

AUSTRALIAN DISTRIBUTOR **TRIO** ACCREDITED SERVICE DEPOT

COMMUNICATION RECEIVERS TEST EQUIPMENT - AMPLIFIERS

WORLD FAMOUS COMMUNICATIONS RECEIVERS

J.R. 200 D.X. DELIGHT



7 Valve. 4 Band. 550 K.C. to 31 Megs. A.M. and C.W. Bandspread. A.N.L. B.F.O. A.V.C. M.V.C. S Meter. R.F. Stage. 240 V. 50 Cycle.

$99.00 £49/10/-

Also available in kitset $89.00 £44/10/-

9R. 59 AMATEUR SPECIAL

9 Valve. 4 Band. 540 K.C. to 30 Megs. Electrical Bandspread. Variable Selectivity. Q Multiplier. A.N.L. A.V.C. M.V.C. S Meter. B.F.O. R.F. 2-IF. Stable Osc. For SSB.

$135.00 £67/10/-

J.R. 60 PRO-AM & S.S.B. V.H.F.

14 Valve. 5 Band. 540 K.C. to 30 Megs. Plus 142 to 148 Megs. Double Conversion. Electrical Bandspread. Variable Selectivity. Q Multiplier. A.M. C.W. SSB. F.M. Crystal Calibrator. A.N.L. A.V.C. B.F.O. Product Detector. Gated eBam. F.M. Det.

$215.00 £107/10/-

TRIO STEREO AMPLIFIERS

W-41U

9 valves. 20 watts. 20-20,000 cycles per channel. Input for tape. Mag. and crystal P.U.

$110.00 £55/-/-

WE-24

7 valves. 12 watts per channel. Input for tape. Mag. and crystal P.U. Direct coupled circuit. 20 to 20,000 cycles. Within ½ D.B.

$95.00 £47/10-

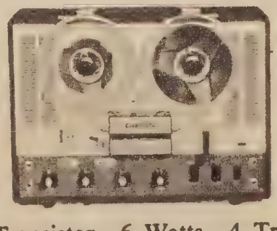
TRIO 2 METER OR 6 METER CONVERTORS

Locked crystal. Low noise cascode circuit.

$55.00 £27/10/-

PAROS

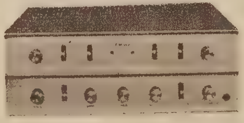
P310 SOLID STATE STEREO



14 Transistor. 6 Watts. 4 Track. 2 Speed 7½ x 3¾. 52 Diodes Thermistors. Freq. Res. 50 to 15K. 7" Reels. Complete 2 mics., 7" tape, 2 speakers.

$195.00 £97/10/-

T.K. 400E SOLID STATE 26 TRANSISTOR 80 WATT STEREO



240V A.C. **40 WATT PER CHANNEL**

Inputs: Phono. Mag. 1½ MV, Tape 1½ MV, Phono. Cryst. 80 MV, Tuner 100 MV, Aux. 100 MV.
Freq. Res.: 20-20,000 plus/minus 1dB.
Controls: Bass, Treble, Loudness, Balance, Separation. $178 £89
VALVE TYPE, AS ABOVE, TK5OOE.
90 watt output.

$170 £85

TRIO W.0.1 SWEEP GENERATO

TV and F.M. 2 to 260 Meg. Sweep 0 to 20 Meg. Ideal for TV Sound and Picture Aligning.

$99.00 £49/10/-

Naturally, the main type of rectifier dealt with is the silicon. However, there is quite a bit of information on other types and comparison charts are included which list the merits of silicon, germanium, selenium and copper oxide units.

To assist the designer, formulas, graphs and charts are included, such that most normal design requirements are met. The problem of transient pulses is very well illustrated, although little is given in the way of solutions. In this section, reference is made to the publication which sets out answers to this problem.

In short, I think that this work would be a worthwhile addition to the bookshelf of all interested in power supply design. The low price makes its inclusion all the more attractive.

Our copy came direct from A.G.E. Pty. Ltd., 103 York Street, Sydney, who will supply copies by mail. On the other hand, this book may also be obtained from leading booksellers. (I.L.P.)

★ ★ ★

ESSENTIAL CHARACTERISTICS, eleventh edition, prepared by R. G. Kempton, J. H. Robb and P. E. Hatfield, of the Tube Department, General Electric Company, Owensboro, Kentucky. Soft cover with loose leaf binding, 326 pages, 8½in x 5½in. Published by the General Electric Company. Australian price $1.80 (18/) post free.

To dispel any vagueness which the title nay leave, this is essentially a book of alve and other data and the best way to onvey to the reader its potential value is robably to give a list of the contents. This s as follows:

Explanation of Terms and Data Used in his Book; Receiving; Five-Star and Speial-Purpose Tubes; Classification Charts; eceiving Tubes, Thyratrons and Gas Filled iodes; Five-Star Tubes; Special-Purpose ubes; Characteristics and Ratings; omestic Near-Equivalents to Foreign Tube ypes; Industrial, Military and Special-Purose Tubes and Their Prototypes; Television icture Tubes; Characteristics Monochrome; haracteristics, Colour; Outline Drawings; andard Configurations; T-X Table; Charteristic Curves; Photoconductive Cells; eed Switches; Typical Circuits; G.-E. ervice Designed Capacitors.

The data given covers a wide range of lve types, etc., as the table of contents ould indicate. However, of necessity and common with other similar publications, e data is of an abridged nature. Neverthess, sufficient information is given for other an detailed design procedures.

One desirable feature of the publication is e way in which the bottom section of the propriate pages are separately hinged. ese show the base connections and it is ssible to have the page open to a partilar valve, with the relevant bottom section o open at the page containing the base nnections.

Our copy came direct from A.G.E. y. Ltd., 103 York Street, Sydney. Copies y be obtained from them by mail. Altertively, large booksellers should also be le to supply. (I.L.P.)

★ ★ ★

-FI YEAR BOOK, edited by Miles Henslow. Hard cover, 340 pages, 8½ x 5½, illustrated. Published by Miles Henslow Years Books Limited, London, England. Australian Price $1.40 (24/) plus 20c. (2/) postage where applicable.

As may be gathered by the title this is annual publication. Within its covers s book contains a wealth of information th for the seasoned Hi-Fi enthusiast and beginner. Detailed listings are given for well-known English high fidelity audio ipment. This equipment is listed in tions such as Amplifiers, Speakers, Microones, Tape Recorders, etc.

The particular manufacturers in these tions are listed in alphabetical order ir components being well illustrated toher with a short description and Sterling ce. The equipment listed is too varied be able to quote the manufacturers' names but include most of the imported equipment available in Australia.

At the start of each section a discussion of the topic pertaining to this section is given. For instance, before the listing of Tuners, a plain language treatise on the function of tuners, their desirable characteristics and methods of connection to amplifying equipment is presented. Another example is the outline of the recent progress of transistor amplifiers. In this outline typical circuit configurations are given and analysed. Also in the appendix of this section are suggested standards for the measurement of amplifiers.

The publication is well laid out with plenty of illustrations and uses good grade paper. The contents we feel sure will prove of interest to the Australian audio-phile. Our review copy from Technical Book and Magazine Company Pty. Ltd, 289-299 Swanston Street, Melboune C1, Victoria. (K.W.)

★ ★ ★

TEKTRONIX AUSTRALIA PTY. LTD. have forwarded the first of a series of bi-monthly newsletters. The expressed purpose of these newsletters is to keep consumers abreast with new instrument releases, pricing details and other interesting information.

Specification sheets received with our copy of the newsletter include information on the following instruments: 184 Time Mark Generator; 281 Time Domain Reflectometer; 529 Waveform Monitor; 549 Storage Oscilloscope; 453 Portable Oscilloscope; C-30 Camera; 1A7 Plug-in Unit; 3A5 Plug-in Unit; 3A7 Plug-in Unit; 3A8 Plug-in Unit; 3L10 Spectrum Analyser Plug-in Unit.

Tektronix would welcome inquiries about any of the above units and/or listing for delivery of the Newsletter. Letters on company letterhead only could be addressed to Tektronix Australia Pty. Ltd., 4-14 Foster Street, Sydney, or Suite 20, 67 Queens Road, Melbourne.

(Continued on Page 158)

Mullard
TRANSISTOR
INTERCHANGEABILITY
LIST
EIGHTH REVISED EDITION
25 cents

MULLARD-AUSTRALIA PTY. LTD. have published a new edition of their popular "Transistor Interchangeability List," and copies are now available, price 25c (2/6) post free from the company's head office at 35-43 Clarence Street, Sydney, or branch offices throughout Australia. This 8th edition tabulates in excess of 2,350 transistor types in the first section. This is followed by a "Broadcast Receiver Transistor Replacement Guide," with about 1,000 listings, which serves as a ready reference of replacements for Japanese and other imported transistors.

2 New
Transistor
Projects
for fledgling
electronic enthusiasts

These kits are designed to try your wings on. . . yet use professional techniques. With Kit No. 1 you use tag-tstrip mounting, then when you progress to Kit No. 2 you use the latest in transistor sub-miniature mounting—copper-backed matrix board.

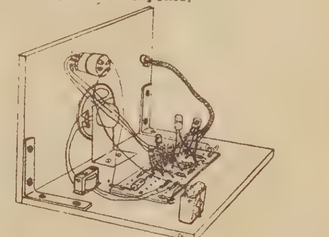
Both kits include a step-by-step instruction manual, fully illustrated and written in such a way that you can't go wrong. Detailed theory is also included so that you can easily understand how your kit works.

Kit No. 1 is a one transistor reaction radio receiver (the transistor is used twice—as a detector and an amplifier) and all parts and tools are supplied—**you don't need another thing after you open the box.**

Kit No. 2 is a three transistor audio amplifier that gives greater loudspeaker volume than you can use when combined with Kit No. 1. You can also use it for—loudspeaker volume for a crystal set . . . home address system . . . record player amplifier . . . voice control switch . : . completing stereo system . . . tape recorder monitor . . . inter-com . . . signal tracer.

Both kits only cost $13.95 (£6/19/6) each and they teach you professional construction techniques right from the beginning. You really learn what electronics is all about with these kits and their comprehensive instruction manual.

The transistors . . . batteries . . . capacitors . . . resistors . . . potentiometers with switches . . . loudspeaker . . . earpiece or microphone . . . tag strips . . . circuit boards . . . sundry hardware you receive can be used again and again in construction projects described in **Transistor Kits new monthly magazine for beginners** free copy with your kit. In this way you ensure that you learn electronics for the least possible expense.



You will be proud to switch on for your family and friends and explain how your radio and/or amplifier works. You will also be satisfied to know you have learnt the latest construction techniques.

Start today, clip the coupon below or write now to:

TRANSISTOR KITS
69A CHURCH STREET,
BRIGHTON, S5, VICTORIA.
PHONE 92-3159

Please send by return (Mark X).

( ) Details of the Transistor Kit Club (FREE).

( ) Kit No. 1 complete with Manual, tools, radio parts, hardware and sundries. Only $13.95 (£6/19/6) for everything you need.

( ) Transistor Amplifier Kit No. 2 complete with Manual, tools, electronic parts including extra transistors, hardware and sundries. Only $13.95 (£6/19/6) for everything you need.

( ) Special Combination Kit comprises kits 1 and 2 for only $25.85 (£12/18/6). You save 20/6.

Cheque/Money Order for £$ .... enclosed. (Complete refund if not satisfied, all kits guaranteed.)

NAME ....

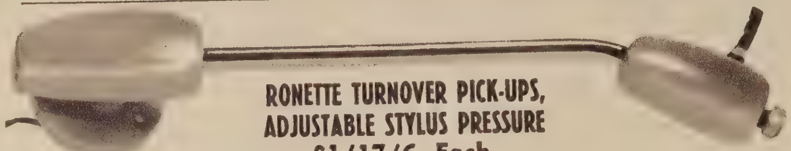
ADDRESS ....

....

TUDOR RADIO

L. E. CHAPMAN
ESTABLISHED 1940

103 ENMORE ROAD, ENMORE, N.S.W.
PHONE 51-1011 PHONE 51-1011



**RONETTE TURNOVER PICK-UPS,
ADJUSTABLE STYLUS PRESSURE
£1/17/6 Each**

TV CABINETS TO CLEAR

Ideal for speaker enclosure.	**£2 each**
Transistor transformers, large	**10 0**
Transistor miniature speaker and drive transformer, pair	**10 0**
TV safety glass	**£1 15 0**
2 and 3 gang Condensers	**10 0**
Garrard plug-in Stereo hds.	**£2 0 0**
TV masks, 17, 21 or 23 inch	**15 0**
POTS 15K, 50M, 1 meg., ½ meg., 0.25, 200M.1in., 50,000 switch, 50K, 20,000.	**5/- each**
POTS 100K	**5/ each**
POTS switch, 10K, 25,000, ½ meg., 1 meg., 100K log	**7/6 each**
POTS 1 meg. gang	**12/6**
10,000	**5/**
POTS Concentric dual, 0.25, 0.25, 0.1 meg., 2,500, 10,000, 0.1 meg., 50,000, 0.1 meg.	**5/ each**
TV Power transformers ideal for Amplifiers 300 mil 225 a side ..	**£4**
Silicon Diodes 210	**7/6 each**
SPEAKER TRANSFORMERS 3 or 15 o.h.m.	**12/6**

STEREO AMPLIFIER KIT SETS

TU 10 3.5 watt per channel, **£12.**
TU 11 including outlets for microphone and tape recorder, **£14.**
TU 12 .5 watt per channel, **£13/10/-**
All kit sets include speakers and every component including valves.
Amplifier kit set 5 watt complete **£11.**
Transistor ear plugs 3 for **10/**
TU 13 watt per channel with TU 11 facilities **£16/-/-.**

TV TUNERS, 13 Channel, New	**£7/10/**, post 7/6
Knobs, long shaft, push on	**12/ doz.**
Knobs, for concentric shaft	**12/ doz.**
Tag strips, mixed	**6/ doz.**
SPEAKER TRANSFORMERS:	
25,000 to 3 ohm	**15/**
15,000 to 3 ohm	**15/**
250 mixed Screws, self tappers, bolts, nuts, etc. ..	**10/** bag, post 2/6
Pots, 200K, 7,500	**5/**
OAK 4 position Switch	**5/**
2 position	**2/6**
Crystal Microphones, good quality, ideal tape recorders, etc. ..	**£1/8/**
Transistor Speaker Transformers, single ended, 5 watt	**15/**
500 ohm Multitap Line Output Transformers	**15/**

BLOCKING OSCILLATOR TRANSFORMERS

10/- each.

PORTABLE RADIOGRAM OR INSTRUMENT CASES, £4/10/-.

Record changers, "Paillard," 78-speed, to clear **£1/10/-.**

SPEAKERS

MSP 20928 12 PQ	**£6 15 0**
Rola 5 x 4 3a 15 ohm	**£1 5 0**
Rola 4 x 3 10 15a 27 ohm	**£1 0 0**
MSP 3½ inch	**£1 0 0**
MSP 8 inch twin cone 15 ohm	**£2 15 0**
MSP 6 x 9 twin cone 15 ohm	**£2 15 0**
MSP 12 inch twin cone 15 ohm	**£3 15 0**
M.S.P. 7 x 5, 3, 15 ohm	**£1 15 0**
Rola 5B 3 ohm with trans.	**£1 5 0**
Mini Cable 4 strand shielded, lots of uses including Microphone Cable	**1/- yard**
Radio knobs push on	**5/- doz.**
Miniature valve sockets 7 and 9 pin	**1/- each**
Octal	**1/- each**
National power transformers 40 mil. 225 a side	**£1 5 0**
TV picture tubes Philips 23 inch new, not regunned, with your dud	**£10**
Philips 1F 455KC	**7/6 each**
Aerial and Oscillator R.S.C.	**5/- each**

SPEAKERS

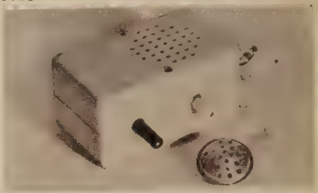
6 x 9 single cone, 15 ohm	**£1 15 0**
8 inch single cone, 15 ohm	**£1 15 0**
8 x 4, 15 ohm	**£1 15 0**
3½ inch, 47 ohm	**£1 0 0**
6 x 4, 33 ohm	**£1 5 0**
2 x ¾, 15 ohm	**£1 0 0**
5 x 3, 47 ohm	**£1 0 0**
5 x 3, 27 ohm	**£1 0 0**
5 inch M.S.P.	**£1 5 0**

Scope soldering iron standard **45/** mini scope **43/3.** Scope delux **49/10,** Vibra-scope **28/.** National scope transformer **54/.**
TV Transformers voltage doubler **£4**

TV AERIALS

All types **£1/15/0** to **£10.**

TELLY MINI TAPE RECORDER



Specifications:
Record and Play Back.
Push-button Controls.
Playing Time, 30 sec.
Batteries, 2, 3V.
Dimensions: 3 9/16in x 2 3/16 x 1 7/8.
Transistors, 4.
Reel Endless, 1 3/8.; Speaker, 1¼, £6/10/.

PUBLIC ADDRESS SPEAKER HOUSING
CEILING TYPE

for 4, 5, or 6 inch Speakers, £2 each. Pack. and post, 5/.

2 AMP Fuses, £1/15/ per box 100
OC 70 Diodes, 4/ each.
12-inch Speaker, 2 ohm Rola, £3. Pack. and post, 7/6.
Transistor Plastic Outside Case, 5/ each.
Transistor Radio Straps, 2/ each.
Stereo Pick-up Arms, £3.
Metal Rectifiers for Battery Electric Radios, 5/ each, pack and post. 1/.
Pilot Light Holders, 3/ dozen.
TV or Cabinet Castors, 4 for 10/-.
100 Mixed Knobs, including TV Channel Change, £5.
3 K Pots, 5/ each.
250 K Pots, 5/ each.
TV Chokes, heavy duty, 10/ each. Pack. and post, 3/.
240-volt AC Record Changers, Stereo, £10/15/; pack. and post, N.S.W., 15/-. Mono, £10, Interstate £1/5/-.
Gramophone Motor and Pick-up, 240 volt A.C., £5/15/. Pack. and post, 10/; interstate 15/.
Push-on Radio Knobs, mixed colours, 5/ doz.
23-inch Picture Tubes, new, slight burn spot, ideal for set testing, £5 each.
OA 70 Diodes, 4/ each.
Morganite and IRC Resistors, mixed bag, 100 useful values, £1 100; pack. and post. 2/6.
100 Mixed Condensers, fresh stock, £1 bag; pack. and post., 2/6.
Electrolytic Capacitors: for Transistor or electric sets: 50, 350, 400, 50, 350 400, 50, 350, 400 **10/** each.

RADIO TUNER KIT SETS

Complete every component, including valves.
£12/10/-. 4 Only.

RESISTORS:
10 watt 6.800 ohm, 10 watt 2.20 ohm, 5 watt 5,000 ohm.
2/- each.

RADIOGRAM CHASSIS NEW MONO

Well-known make. Complete and tested. **£12/10/-.**

ANSWERS TO CORRESPONDENTS

When writing to us:—

- **Please give your name and full postal address, including the State . . . N.S.W. &c.**
- **Write the above information clearly or, for preference, print it in block letters. Your co-operation will facilitate delivery of replies by mail, where such are called for.**

BASIC RADIO COURSE

.P. (E. Hawthorn, Vic.) writes asking about the Basic Radio Course which was mentioned in our December 1965 issue.

he Basic Radio Course was printed over long period and dealt with fundamentals f radio and electronics. Tearsheets and hotostat copies of the various sections are vailable through the information service. he complete course made up from these available for $3.90 (39/). We do plan om time to time to add to the Basic adio Course articles, which may appeal our readers.

TV RECEPTION

.A.C. (Bourke, N.S.W.) mentions that he is at present using stacked yagis together with a masthead amplifier in an endeavour to procure reasonable TV reception. He continues by asking whether a phased array, commercial or amateur construction, would give better results.

is evident from your letter that you e in a deep fringe area and the steps hich have already been taken would pro- bly result in the best reception that can obtained. The reception of TV signals der your conditions is subject to many riables in propagation conditions and anging from one type of antenna to other is unlikely to bring about any rthwhile improvement.

MORE ABOUT STEREO

B. (Bellevue Heights, S.A.) says that he listened to some of the twin AM stereo broadcasts but with a rather ill-assorted set of equipment. He didn't think it warranted anything better because it was a temporary arrangement and too low-brow for his liking. He also asks about a transistor ignition system.

ur judgment about the system being tem- rary certainly proved to be true, while ur desire for high-brow material, con- ting with calls for the not-so-high, licate the impossibility of pleasing every- dy with a single channel. We cannot er any opinion on the imported transis- ised ignition unit, except to observe that rd-starting was certainly not a charac- istic of our own design. Pushing up the nding current during start would doubt- s give you more spark but it is anybody's ss how it would affect the transistor. en we were doing the developmental rk on our own unit, we found ourselves gling fractions of an ohm inside and side the coil, watching voltages and rent very closely, along with the spikes displayed on a CRO. To change things und in arbitrary fashion is akin to cking your neck out," since you have clue as to the safety margins which may may not have been designed into the t.

STATION POWER

C.L. (Warragul, Vic.) writes to point out that stations 2KM and 3UL no longer reduce power at night; they operate full time on 2KW.

Thank you for the information and we will make the necessary correction in our station list when next published. We will consider your suggestion that a notation be added to indicate the use of a directional antenna system.

AMATEUR LICENCE

R.G. (East Bentleigh, Vic.) is very keen on short-wave listening and would like details of what is required to procure an amateur transmitting licence.

There are two classes of amateur licence in Australia, the first is the A.O.C.P. for which it is required to pass an exam in radio and electronic theory, regulations, and morse. The second licence is the L.A.O.C.P. which requires the same examinations except for the morse code. The L.A.O.C.P. limits the holder to operation on frequencies above 52MC but can be converted to the other class of licence at a later date by passing the examination in morse code at 14 words per minute. Full details of these examinations can be obtained from the Radio Branch of the Melbourne, G.P.O. and sometimes a sample examination paper can be obtained. If you wish to meet other people with your interests, we suggest that you consider joining the Wireless Institute of Australia. This organisation holds monthly meetings and seeks to encourage newcomers in the field of radio amateur operation. The address can be found in the Melbourne telephone book.

FM TUNER

W.S. (Bexley, N.S.W.) writes expressing his interest in the possibility of an FM tuner for TV sound.

While we have received only a small number of letters from our readers expressing interest in this type of project we are looking into the practical aspects of producing a stable tuner capable of covering the wide frequency range of the TV channels. If the idea seems practical we may consider it at a later date.

N.Z. COPIES LATE

A.C. (Invercargill, N.Z.) complains that readers in New Zealand get their copies of "ELECTRONICS Australia" weeks behind Australian readers.

We are aware of this problem and are trying to devise ways and means of reducing the time lag at this very moment. Basically it is a question of the limited shipping facilities between the two countries, air freighting being quite out of the question, at present. Bulk supplies of an issue may just catch a ship or just miss it and, to introduce some regularity into New Zealand publication dates, it is necessary to maintain some kind of a time lag. New Zealand readers anxious to minimise the delay would be well advised to subscribe direct. While shipping problems affect sea mail as well as sea freight, there is a good chance that direct, mailed copies will arrive ahead of those which have to negotiate formal distribution channels.

INFORMATION SERVICE

I.P.C. (Wollomombi, N.S.W.) includes several inquiries in his letter ranging from details of cathode ray tube connections to details on SSB transceivers.

We regret that we cannot devote space in our answers to correspondents to the publication of valve data, etc. If this information is required, and is available from our files, we can supply it through the normal 20c (2/) information service. Your ideas on transmitter, receiver and transceiver operation are along standard lines and there is no reason why they should not be successful. For transceive operation when the Vackar VFO is used to feed the receiver we suggest that a cathode follower stage in the transmitter section alongside the VFO will allow a long lead to be utilised without effecting the frequency of operation. We cannot supply coil details for equipment that is not described in the magazine so we are unable to help with the inquiry about coils. One of our recent staff members has produced a SSB transceiver which may be featured later this year. However at the time of writing this will depend on the availability of certain components including a reliable filter.

"ELECTRONICS Australia" INFORMATION SERVICE

TO assist readers, "ELECTRONICS Australia" conducts a technical information service. Conditions governing this service are set out below:—

(1) Address letters to: Assistant Editor, "ELECTRONICS Australia," Box 2728, G.P.O., Sydney.

(2) Requests for copies of circuits or technical information requiring a postal reply must be accompanied by postal note or stamps to the value of $0-20 (2/-). Queries not accompanied by a fee will be answered in rotation on these pages.

(3) For the $0-20 fee, we will supply circuit data, as available, from our files. The amount of data available varies, but in no case can it include information additional to that already published in the magazine. For complicated projects involving material extracted from more than one issue, an extra fee may be requested. As a rule, requests for circuits will be answered more speedily if they are not complicated by questions requiring the attention of technical personnel. Where articles are not on file we can usually provide a photostat copy at $0-20 PER PAGE.

(4) The information service is aimed primarily at assisting readers in matters relating directly to articles published in the magazine. Answers will be given in note form and only so far as can be drawn from general knowledge of the relevant subject. We cannot provide lengthy answers, undertake special research, discuss commercial designs or draw special circuits. Please note that the inclusion of an extra fee does NOT entitle correspondents to special considerations.

(5) The editor reserves the right to return fees or to limit the scope of an individual reply when it is felt that a partial answer will be better than none at all.

(6) In addition to the above service, chassis blueprints are available for most of our projects showing the position of holes and cutouts for metal-working, but containing no details of wiring. Apart from complicated projects like TV sets and oscilloscopes, most blueprints cost $0-50 (5/-) each. Original photographs of most projects are also available, from $0-50 for a 6in x 8in glossy print, postage $0-08 (9d).

(7) "ELECTRONICS Australia" does not deal in radio components nor will we debate the relative merits of competitive products. Prices and specifications should be obtained from advertisers.

(8) Technical queries are not answered by telephone.

(9) We have no file of circuits for commercial radio or TV sets, etc.

(10) A fairly good range of back numbers is available. On issues up to 6 months old there is a surcharge of 5c (6d). On issues from 7 to 12 months old the surcharge is 10c (1/-). Over 12 months, it is 20c (2/-).

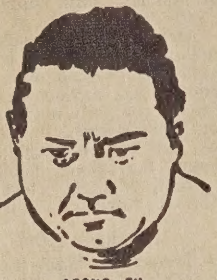
DON'T BE BULLIED!

WHY BE PUSHED AROUND . . . SURPRISE ANY WHO DARES ASSAULT YOU!

You Too Can Become a Fearless Exponent Of

CHINESE KUNG-FU KARATO

. . . the authentic Chinese, Self-Defence Art that DISABLES INSTANTANEOUSLY ON CONTACT



LEONG FU
梁 富

Because of religious belief forbidding the ancient Chinese monks from carrying weapons, this weaponless system of superhuman fighting was founded and developed by them to such an extent that they could successfully resist and defeat blood-thirsty robbers who attacked and slayed them just for the robes and trinkets they wore. Taught exclusively and handed down only to selected disciples, who were sworn to complete secrecy, this devastating art with its amazing power to paralyse, borrow or multiply fighting strength ten-fold and to disable instantaneously on contact even the strongest man on earth without the use of brute strength is now completely revealed and brought up to date for the first time in the English language by Leong Fu, the acknowledged greatest living master of Kung-Fu Karato today.

LEARN QUICKLY AT HOME, THIS FASTEST, EASIEST, AND MOST EFFECTIVE SELF-DEFENCE SYSTEM OF ALL TIME!

Ask any high-ranking blackbelt Karate or Judo expert who has made the mistake of fighting a Kung-Fu master and he will tell you why he would rather fight any five armed persons trained in any other form of combat than meet just one unarmed KUNG-FU MASTER. That is because what they learned from Karate, Jiu-Jitsu, Judo, Aikido, the so-called Westernised Kung-ru and all other martial arts combined, actually consist of only a small part of authentic Chinese KUNG-FU fighting which leaked out of China to Japan in ancient days to found their combat systems.

AGE, BODILY SIZE, SEX AND SUPERIOR STRENGTH DON'T COUNT!

Because KUNG-FU disables ON CONTACT and because KUNG-FU uses amazingly simple secret anatomical movements and steps instead of brute strength to overcome attackers, sex, size and age does not matter very much. In fact, the greatest KUNG-FU master of all time, the Honorable Lee Hua-Tsein (Sheng Dynasty) was a slender scholarly looking man. Yet this man developed this super-human skill to such an extent that his name was feared throughout the Orient in his time. When he was finally invited by the Emperor of China to demonstrate his skill, the Emperor was astonished to find the man whose very name was enough to put to flight the most ferocious ruffian, was not a fierce giant, but a simple, gentle, quiet, scholarly man who stood barely five feet and weighed less than 100lb fully clothed. Not much of a person to look at, but nonetheless a man who put out of action within a few minutes, 20 hand-picked members of the famed IMPERIAL GUARDS.

YOU CAN PARALYSE A 300lbs THUG WITH JUST ONE FINGER OR EVEN ONE TOE!

No longer need you stand helpless while you or your girl-friend are being assaulted, insulted, bullied and humiliated by trouble-seeking bullies because henceforth you can send them flying in every direction. Amazingly enough, many of these techniques can be executed without great strain because they **DISABLE ON IMMEDIATE CONTACT.**
By just pressing a finger or toe on the right spot of your assailant's body you can paralyse, render unconscious or escape from deadly grips. You can quite easily flatten bullies three times your size, leaving them helplessly stunned on the ground.
YOU LEARN techniques that can OUT-WIT, OUT-FIGHT, OUT-MANOEUVRE NOT JUST ONE OR TWO, BUT THREE, FOUR, FIVE OR EVEN A SMALL MOB OF ARMED HOODLUMS. And in order to safeguard yourself, many of these techniques are delivered with a minimum of close body contact. With your new power NOTHING CAN SCARE YOU, and you can live with full confidence in the knowledge that you can defend yourself, protect the weak and deal successfully with ANY MAN, ANY ASSAILANT, ANY TIME, ANY SITUATION AND ANYWHERE. With KUNG-FU KARATO, I guarantee you the ability to live, to work and to walk without fear.
For Complete FREE DETAILS, send your name and address to me by **AIR MAIL**, and I will send you my FREE PROSPECTUS, ALSO BY **AIR MAIL**.
Send in the coupon TODAY! NOW! This offer may never be repeated again.

MAIL THIS NO-RISK COUPON TODAY

HONORABLE MASTER LEONG FU
(Dept. K/2, 119 Anderson Road, IPOH, MALAYSIA.

Please send by air free details of Chinese Kung-fu Karato to:

NAME ....

ADDRESS .... (Dept. K/2)

TECHNICAL BOOKS AND PUBLICATIONS

(Continued from Page 155)

HEWLETT-PACKARD JOURNAL fo January, 1966 (Vol. 17, No. 5) is devote mainly to a description of a new high stability AC voltmeter with a 10MC fre quency range and 1 per cent accuracy Model 400E. It is said to be the first o its type to achieve ground-referenced D output. A supplementary article describe a method of measuring liquid layer thick ness with time domain reflectometry (Inquiries should be addressed to th Hewlett-Packard representatives in Austra lia, who are Sample Electronics (Vic.) Pt Ltd., 9-11 Cremorne Street, Richmond, E Victoria.)

STC COMPONENTS AND EQUIP MENT REVIEW for January, 1966 (Vol. No. 1) has application notes referring t alarm and annunciator circuits usin Shockley four-layer diodes. The circui described are: Basic Alarm which cause a signal lamp to light when either momentary or steady alarm conditio occurs; Alarm Circuits with a flashin master indicator; Alarm Circuit with steady master indication and a test butto Alarm Circuit with individual flashing ligh Published by the Industrial Products Div sion, Standard Telephones and Cables Pt Ltd., Moorebank Avenue, Liverpool, N.S.V

TECHNICALITIES is a new produc magazine published by Tecnico Electroni Pty. Ltd., Carrington Road, Marrickvil (one of the Pye Group). The latest issu describes the following products: Fro Precision Applied Research — Precisio Lock-in Amplifier, Model HR-8; Two-pha Lock-in Amplifier, Model JB-6; Low Noi Amplifiers, Models CR-4 and CR-4A; Pr cision Voltage/Current Reference Sourc From Dytronics — Band-pass Filter, Mod 719, a narrow band-pass filter with fr quency range 0.1cps to 1,000cps; Notc Filter, Model 730, range 0.1 to 10,000cp From Ferris Instrument Company — Pr cision Frequency Standards and Rad Noise Meters. Also described are four micr wave signal sources and three wide fr quency range microwave generators fro Flann Microwave Instruments; and pr ducts of Bell Inc., Gulton Industries a Industrial Electronics Corporation.

RADAR PRINCIPLES AND PRACTICE by Jonathan Mivec. This book was reviewed in our last month's issue from a copy supplied by another bookseller. A further copy has now been submitted by McGill's Authorised News Agency, 183-185 Elizabeth Street, Melbourne, from whom the book may als be obtained, price 56/6 posted.

AMALGAMATED WIRELESS VAL COMPANY PTY. LTD. has availa copies of an applications note published RCA entitled "Gate Parameters of R SCR's for Trigger Circuit Design." T takes the form of a six-page double-f leaflet. The construction of typical R SCR's is described, with particular ref ence to the gate-cathode characteristics a requirements, switching characteristics a gate power dissipation. The three ba types of circuit to trigger SCR's are th outlined, i.e., DC triggering, AC triggeri and pulse triggering. The note is ill rated with numerous diagrams of char teristic and performance curves. Inquir to Amalgamated Wireless Valve Co. P Ltd., Private Mail Bag, Ermington, N.S.

TRADE TELE-TUNERS PTY. LTD. prepared an "Australian Television Tu Manual" which contains information tuners used in all TV receivers manuf tured to date in Australia. Copies are av able, to the servicing trade only, from company's offices, located at 55 Hu Highway, Greenacre, N.S.W.

CLASSIFIED ADVERTISING

Advertisements in these columns cost 50c per line. Each line contains the equivalent of five words each of nine letters. Minimum size of advertisements is two lines. PAYMENT MUST ACCOMPANY ALL ADVERTISEMENTS EXCEPT THOSE PLACED BY ACCREDITED AGENCIES. Your advertisement for the May issue must reach our office before April 9th. Address your advertisement to the Advertising Manager, ELECTRONICS Australia, Box 2728, G.P.O., Sydney.

FOR SALE

OMPONENTS SALE, all new RF chokes, 2.5mH, 0c. Crystal set coils, 28c. Ganged tuning ondensers, 58c. Transistor 455KC IF coils, 0c. ½ watt resistors, any value, 9c each; peakers, 5 x 3, 47 ohm, $1.80. Transistors, C71, OC74, 68c each. OC169 (equiv OC170), 8c. Miniature 5K volume controls, with switch nd knob, 75c. Prompt service. Add 10c post. nd packing each order please. Hallard Elecronics, Box 58, P.O., Campsie, N.S.W.

ANSISTORISED R.F. AMPLIFIER KIT. Ineases the sensitivity, selectivity and sig./noise atio of any valve or transistor receiver without aking circuit alterations. Power gain: 20dB. deal for use in areas of low signal strength or r radios. Kit is complete to the last screw. ull price 35/ or $3.50. Prompt service given. allard Electronics, Box 58, P.O., Campsie, .S.W.

ANSISTOR 2 RECEIVER KIT. By using a pecial regeneration circuit the range of this set 30 miles, without aerial or earth. Sensitivity reatly increased with short aerial. This is a ery practical receiver and an ideal project for e beginner. A full technical explanation is iven with the comprehensive instruction bookt. The kit is complete to the last screw inuding the 9V battery. Transistors used OC169 nd OC71. Special price 65/ or $5.50. Halrd Electronics, Box 58, P.O., Campsie, N.S.W.

ANSISTOR 4 RECEIVER KIT. We have just eleased a very sensitive portable receiver using efficient reflexing circuit employing voltage oubling diode detection, coupled to a high gain nplifier, the output drives a 5 x 3 speaker proucing a quality sound. The plastic cabinet is overed with white leather, which is very attracve. Kit is complete to the last screw. This t makes an ideal companion at home or in e car. Transistor complement: OC169, 2 X C71, OC74. Full price £7/2/6 or $14.25. rompt service. Hallard Electronics, Box 58, .O., Campsie, N.S.W.

MMUNIC. receiver Eddystone 680X, 5 band 0KC—30MC 15 valves, crystal filter, noise encer, variable selectiv. 2 RF stages, precision al. Technical manual, loudspeaker, $180. K4MY, 10-26th Ave., Palm Beach, Qld.

IR New Voice Deluxe 10 transistor transivers, crystal controlled. Leather cases, excelnt condition, $50. Phone 93-6650. Write rontrol, Box 3376, G.P.O., Sydney.

STOM built transformers:— Power, Audio, etc. ngle or quantity production. Battery Chargers, ctifiers, electric motors, transistor radios. eneral engineering, fitting and turning, sheet etal work, etc. Parkinson Transformers, P.O., ox 523, South Brisbane. Phone Beenleigh 33.

PE ADAPTER, RTV and H. Nov. 62. Collaro ¼ ck stereo deck, third head fitted, part built binet, virtually new, bargain $130. Also half ck mono with Collaro deck, no cabinet $55, o R. TV and H. all transistor karset 12V 0. Sydney, 85-6618.

STINGHOUSE TV 21in American with 240V ansformer. Needs little attention. Appearance new, £20. **North Sydney, 92-8017.**

-64 Medium range transceiver 9 transistor ystal controlled receiver and transmitter. eight 1:15lb with batteries. Dimensions 8 x x 1 2-3in. Ant. 4.8ft telescopic, metal case. ather carrying case, £40 per pair. Kelly ugarno" Rugby, via Crookwell, N.S.W.

MMONWEALTH Electronics 12c sync. turnle, £30. New limiting amplifier, bridging int plus 24dBM output, 30dB compression, £75. cIntosh, TVQ-Q, Box 751K, G.P.O., Bris., Qld.

AD 22 pre-amplifier and two 35 watt RMS wer amplifiers, .1% T.H.D. McIntosh, TVQ-O, x 751K, G.P.O., Brisbane, Qld.

M OC44, 71, 72, 73, 74, SFT122, 108, 152, 217, 269S, 70c ea., OC84, OA210, 75c ea. 211, $1 ea. OC171, 2N370, 371, AF116N, 7N, BYZ13, OA31, $1.25 ea. 2N301, 257, .60 ea. OC23, 28, 29, 35 SFT240 $1.10 ea. , 10, 81, 85, 91, 95, 30c ea. New Record- Tape, 1800ft, 7in reel $3 ea. 2400ft, $4 ea. S.A. sales. Pack. and post, 15c. Custom ectronics, Box 1452, G.P.O., Adelaide, S.A.

EED controlled transformers 240v-12VDC at each. Playmaster 106 label, $2.25. Rola 8 8in speaker, $4.50. Details on above on reest. Six brown/gold knobs for 106 $1.75, stal replies only. K. Slingo, 18 Stirling Rd., rt Augusta, S.A.

V and H. Back numbers 1949-1961 complete. one price, 1/9 each. Prefer sell lot, 150 for 1. Ring Ron, 219-9412 day, 35-2756 night, S.W.

DEL ships, "Endeavour" Bark. Detail Bluents, $4.55 set. Bolton, 72 King St., Sydney. alogue 75c.

HMV console, cost over £200, sell good rking order, £19/10/. 103 Enmore Rd., Enre, N.S.W.

17 inch, needs repairs, £10. Tudor Radio, 3 Enmore Rd., Enmore, N.S.W.

P. KIT Hi-power, 4 valves, all parts incl. full tr. trans. and rec. Mono Hi-Fi, $56. Speaker match $10. Apply Woof, 49-4033, Killara, dney.

FOR SALE

TRANSISTOR radiogram chassis perf. cond. £8/10/. Tudor Radio, 103 Enmore Rd., Enmore, N.S.W.

POPULAR Sacred recordings at wholesale prices. All new 12in L.P. Several labels. AIMO, Box 15, Footscray, Vic.

BUSINESS opportunity, ideal for handyman or professional used to radio and electrical work. Coin operated automatic phonograph operation on Queensland's central coast, consisting 20 machines which grossed £8,500 per tax return 64-65. Requires five or six hours per week to operate giving plenty of time for professional to solicit other business from this prosperous area. Price on application. Box 314, Bundaberg, Qld.

BYER 66 professional tape recorder for sale, highest genuine offer over £100. First class condition, apply Manager, Stereophonic Industries, Box 314, Bundaberg, Qld.

SOLAR H.W.S. easily built, full value plans. 70c. Post free. Box 43 Wembley, W.A.

CONVERT any television to sensitive big-screen oscilloscope. Only minor changes required. Illustrated plans $1.25. P. Hole, 43 Taronga Parade, Caringbah, N.S.W.

RECORDING TAPE SPECIALS. Mylar 3¼in x 375ft, $1.10; 5¾in x 1200ft, $2.65. All sizes stocked. One third off and fully guaranteed. Post free. Obtain our low quote for recorders, players, electrical goods. AIMO, Box 15, Footscray, Vic.

GOOD 12AT7, 6AM5, 6AM6, etc. 10c each. Write Doug Wheller, 29 Birdwood Tce., Auchenflower, Brisbane. 70-1480.

X20 Amplifier (built) $33.50. X10 Amplifier $19.50, MAT 20, MAT 100, $1.55. MAT 121, MAT 101, $1.70. Sinclair Micro-amplifier, gain 60dB (1,000,000), $5.30, OC28, OC35, $1.65. OC71, 75c. Send S.A.E. for EQ list.

TRIO Stereo amp. Labcraft T'table, Wharfedale boxed speakers, perfect cond. £30. T.O.T. B102, OHC. Bundock Street, Townsville.

TV, Healing, 21 inch, working order, £22. Tudor Radio, 103 Enmore Rd., Enmore, N.S.W.

ARMSTRONG 226 AM-FM stereo tuner-amplifier, as new, $180, freight paid. Harris, 15 Balfour Street, East Brighton, Vic. 92-6607.

TAPE RECORDER BARGAINS. new and used machines. Buy from a technician, not a salesman. Free technical advice. All repairs and accessories. Country inquiries welcomed. Tomlin's Radio, 528 Liverpool Rd. South Strathfield, N.S.W. 642-4215, Sydney.

UHER AUTOMATIC TAPE RECORDERS. For those who want the ultimate in perfection. Sound operated relays, built-in 2-channel mixer, auto slide projection, 4 heads, 4 tracks, 4-speed A and B monitors, reverb., echo., stereo, mono freq. range to 20Kc, plus or minus 3db dynamirange to 60db. Wow and flutter less than 15 per cent, channel sep. 50db, V.U. meters, auto. rewind, clutches for tape protection, sound on sound, gold relay contacts, auto. torque controls, remote control, rewind, playback recording stop and start, disconnectable auto. recording level control, batt. and A.C. operation, etc., etc. German made, light and compact. You will never see more features or quality for your money. Push-button control. A dream to operate and own. Prices from £145 to £250/10/. N.S.W. Distributors: Tomlin's Radio, 528 Liverpool Rd, South Strathfield. 642-4215. Country and Trade Inquiries welcome.

TV PICTURE TUBES:

1-year warranty $10.
2-year warranty $12.
Plus old tube.
These are Trade Prices.

All types except bonded and 27in. These tubes have an all new gun (cathode, heater, base, etc.). All duds must be under vacuum and scratch free. When ordering by mail, add freight. Distributors wanted. Sure Brite Picture Tubes, 22a Victoria St, Lewisham, Sydney, N.S.W. Phone: 92-7743.

GENUINE polished colourful North-West Gemstone pendants, rolled gold or silver chains. Excellent Xmas gifts. Send Postal Note 17/6 each, two for 30/. Trade enquiries welcome. W. A. Gemstone, Box 42(E), Applecross, W.A.

MINERALS, 10 samples of W.A. minerals in attractive plastic box, including hermatite, zircon, beryl, galena, limenite, etc., with literature. Ideal for students, rockhunters. Send postal note 25/. Box 42(E), Applecross, W.A.

FOR SALE

GARRARD Autoslim Stereo. 4-speed Recordchangers. These new, popular, latest model units available now, £12. Post and packing: N.S.W., 15/; Q.d., Vic., Tas., 22/6; W.A., S.A., 30/.
PROFESSIONAL TV SERVICE.
Box 36, Queen Vic. Building P.O., Sydney.

SELL, all back issues "Electronics Aust." in stock at all times. 1939-55 copies 20c; 56-59 30c, 1960 to date 40c. Post incl. T. WEIR, 56 O'Connor St, Haberfield, Sydney. 71-2569. Wanted to buy copies.

READER SERVICE

DO you wish to import or are you requiring finance for imports? Make use of our expert shipping services. Lupton, Box 3376, G.P.O., Sydney. Phone 93-6650.

TAPE RECORDER OWNERS! Join Australia's most progressive tape recording organisation offering a monthly magazine — "The Microphone," bimonthly "Newstapes," and full discount service. Full details are available from the secretary, A.T.R.S., Box 9, P.O., Crow's Nest, N.S.W.

MICROGROOVE discs from your tapes. Also tape copying service. Highest quality discs at all speeds. Prompt service. Moderate charges. Country and Interstate inquiries welcomed. Vitatone Recording Studios, Box 18, Post Office, Lane Cove, N.S.W. Phone (Sydney) 42-6154.

ELECTRONIC ORGANS. Do not build yourself an organ without first consulting us. Send for initial information on the superb Schober (U.S.A.) build-it-yourself kits. No stamps required. The Electronic Organ Co., 124 Livingstone Ave., Pymble, N.S.W. (Mail only.)

REPAIRS TO RECEIVERS, transmitters, construction, testing TV alignments, Xtal convs., any frequency. £20/10/ plus tax. Eccleston Electronics, 146a Cotham Rd., Kew, Vic. 80-3777.

ORGAN COMPONENTS. Send for our illustrated catalogue listing parts, kitsets, circuit data and electronic organ keyboards, pedal boards, contact wires, wiper plates, contact blocks, stop switches, stop tabs, piston switches, coupler switches, multi-type relays, toe piston, expression controls, solenoids, etc. Also many sundry parts such as felt strips, springs, felt washers, threaded rod and components for pneumatic action.

For the benefit of experimenters we list sets of data sheets available for several different designs of organs.

Alan Douglass, a transistorised design and the Clyde organ construction kitset. "Harmonics" pre-assembled units and complete organs.

Please send 5/ cheque or postal note to cover part cost and printing and posting. Peska Pty. Ltd., P.O. Box 306, Frankston, Vic.

WANTED

WANTED: Garrard single speed 4in reel/magazine tape deck, 41-4216, Sydney, N.S.W.

C.R.O. 5in Heath, wide band. 44-3820 or Box 1 P.O., St. Ives, N.S.W.

WANTED: Wharfedale RSD12DD and cabinet, phone Sydney 95-4492.

EXCHANGE

EXCHANGE Dishmaster, good condition, for Sweep generator. Phone 666-9279 Sydney.

VEROBOARD
STOCKS ARRIVING THIS MONTH
Send Stamped Addressed Envelope for Details and Price List.
VEROBOARD
P.O. BOX 318, Crows Nest.

COMPUTER CIRCUIT BOARDS

20c (2/-) per transistor, includes all condensers, resistors, diodes, etc. $2.00 (£1) minimum order. Limited stock.

Australian Electronics
76 View St., Hobart, Tas.

NEW KNOB IDEAS
IN ALUMINIUM
High Quality At A Moderate Price
Made in Australia by Positronics.
DISTRIBUTED BY ACME ENGINEERING CO. PTY. LTD.,
132 BURWOOD ROAD, BURWOOD, VIC. Tel. 28-5511.
PLEASE WRITE FOR DETAILS OF FULL RANGE.

ACTUAL SIZE

CLASSIFIED ADVERTISERS

USE THIS FORM FOR YOUR NEXT ADVERTISEMENT TO APPEAR IN THE

ELECTRONICS Australia Classified Columns

To the Advertising Manager,
ELECTRONICS Australia,
Box 2728 G.P.O.
Sydney.

ENDORSEMENT ....

ADDRESS .... STATE ....

- *Please insert the following advertisement in the* ....*issue*
- *I enclose P. Note/Cheque for $*....

£...s...d.... being full payment for .... lines at $0-50 (5/-) per line.

☐ FOR SALE · ☐ WANTED ☐ READER SERVICE ☐ POSITION VACANT

Please write in block letters with ink or ball-point pen. Number of insertions

"ELECTRONICS Australia"

SPECIAL ORDER FORM

Guarantee yourself a complete set of issues for your library with no copies missing.

SUBSCRIPTION RATES

	PER YEAR	
Commonwealth, Fiji, N. Guinea	$3-50	£1.15.0
United Kingdom & N. Zealand	$4-00	£A2. 0.0
British Dominions	$4-00	£A2. 0.0
Foreign	$5-00	£A2.10.0

POST THIS COUPON TO:—

**The Circulation Manager, ELECTRONICS Australia,
Box 2728, G.P.O., Sydney. Australia.**

Name ....

Address ....

Enclosed is $.............. *for* .... *years. Start with* ....

ADVERTISING INDEX

A.C.E. Radio 132, 133, 134, 135, 1
Acme Eng. Co. .. ..
Adcola Pty. Ltd. .. ..
Aegis Products Pty. Ltd. 1
AKAI Electric Co. Ltd. .. ..
Amalgamated Wireless (A'sia) Ltd. Inside Front Cover 16, 100, 1
Amalgamated Wireless Valve Co. .. ..
Amateur Astronomer Supply Co. 1
Amplion (A'sia) Pty. Ltd 37, 1
Anodeon Sales Div. .. ..
Arrow Electronics Co. Pty. Ltd. 1
A.R.T.C. .. .. Back Co
Asdic Stereo Specialists and Brisbane Agencies .. .. Inside Back Co
Atram Pty. Ltd. .. ..
Audio Eng. Pty. Ltd. .. ..
Australian Sound and TV Co. .. ..
Australian Electronics 1

Ball Electronic Services 1
Bright Star Radio Pty. Ltd. 1
Broadway Electronics Pty. Ltd. 2, 3,
Broughton, Peter .. ..

Central Imports Pty. Ltd. .. ..
Clow Sound Systems 1
Classic Radio 110, 1
Classic Tape Recorders 1
Classified 1
Convoy International Imports .. ..
Cunningham, R. H., Pty. Ltd. 1

Danish-Hi-Fi .. ..
Decca .. ..
Deitch Bros. 1
Deitron Electronics .. ..
Disc-Record Studios 1

Electronic Developments Pty. Ltd. .. 102, 1
Encel Electronics .. ..
Ericsson L. M. Pty Ltd. .. ..

Fairchild Australia Pty. Ltd. 4,
Falk, Fred A. & Co. Pty. Ltd. .. ..
Ferguson Transformers Pty. Ltd. .. ..
Ferrograph .. ..
Fox and MacGillycuddy Pty. Ltd. .. ..

General Accessories Pty. Ltd. .. ..
General Electric Pty. Ltd. .. ..
Goldring Eng. Pty. Ltd. 48,
Goodmans .. ..
G.R.D. Instruments Pty. Ltd. .. ..
Green Corp. Pty. Ltd. .. ..

Ham Radio Suppliers 124,
Hare and Forbes Pty. Ltd. .. ..
H.B. Radio Sales 105,
Homecrafts Pty. Ltd. .. ..

International Correspondence School ..

Jacoby, Mitchell and Co.Pty. Ltd. 10, 66,
JH Reproducers Pty. Ltd. .. ..
Johnston D. R. Pty. Ltd. .. ..

Lafayette Electronics .. ..
Leong Fu .. ..
Leroya Industries Pty. Ltd. .. ..

McLellan, W. J. and Co Pty. Ltd. .. ..
Magnetic Sound Industries .. ..
Magrath, J. H. and Co. Ltd. .. ..
Man's World .. ..
Manufacturers Special Products .. 31, 64,
Master Electrics Pty. Ltd. .. ..
Mastersound Sales Pty. Ltd. .. ..
Mullard-Australia Pty. Ltd. .. ..

National Radio Supplies 144, 145,
Newnes, George Pty. Ltd. .. ..

O'Rourke Industries .. ..
O.T. Lempriere Pty. Ltd. .. ..

Paton Electrical Pty. Ltd. .. ..
Philips Electrical Pty. Ltd. .. ..
Positronics .. ..
Pye Pty. Ltd. .. ..
Precision Windings .. ..

Quad .. ..

Radio Despatch Service .. ..
Radio House Pty. Ltd. .. ..
RCA of Aust. Pty. Ltd. 75, 76, 77
R.C.S. Radio Pty. Ltd. .. ..
Recorded Music Salon 119,
Rola Special Products Pty. Ltd. .. ..
Rosicrucians .. ..
Rowe H. and Co. Pty. Ltd. 34,

Selectronic Components Pty. Ltd. .. ..
Simon Gray Pty. Ltd. 18, 84,
Stotts Correspondence School .. ..
Sure Brite Picture Tubes .. ..

Trio Corporation .. ..
Telecomponents Pty. Ltd. .. ..
The Reader's Digest .. ..
Thorn Special Products .. ..
Transistor Kits .. ..
Tudor Radio .. ..

United Radio Distributors .. ..
University Graham Instruments .. ..

Warburton Franki Ltd. 2
Watkin Wynne Pty. Ltd. 101,
William Willis and Co. Pty. Ltd. 105, 85
Wireless Institute of Aust. (Vic.) 41
Wonder Wool .. ..

Zephyr Products Pty. Ltd. 6